

RA PD 464197A

- A—Erecting-strut fork
- 1—Lubrication fitting
- 2—Sleeve bushing
- B—5/8 — 18 x 1 1/2 socket-hd capcrew (4)
- C—5/8-inch lockwasher
- D—Strut arm assy 9032858
- 1—Lubrication fitting
- 2—Sleeve bushing
- E—Strut arm assy 9032849
- 1—Lubrication fitting
- 2—Sleeve bushing
- F—Cross-member arm

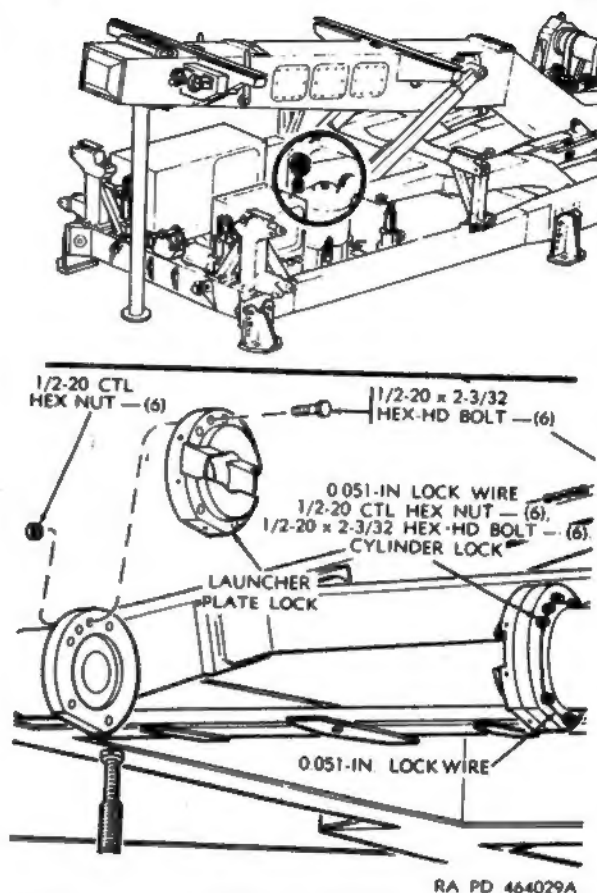
Figure 118. Strut arm assembly—disassembly and assembly.

## Section VI. MAINTENANCE OF LAUNCHER HYDRAULIC SYSTEM

### 79. General

This section describes the maintenance of the hydraulic pumping unit assembly, the hydraulic panel, the hydraulic oil reservoir assembly, and the equilibrator accumulator. Coverage is also provided for the tube and pipe assembly and fitting networks for the hydraulic pre-charge system, axial pistons pump system, locking wedge hydraulic system, down-lock hydraulic system, erecting hydraulic system, equilibrator hydraulic system, up-lock hydraulic system, and the missile hydraulic system. The general precautions prescribed in paragraph 58 must be observed whenever any hydraulic system maintenance is performed.

C17



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Figure 119. Launcher plate-lock (1021 through 1258)—removal and installation.

### 80. Hydraulic Pumping Unit

The hydraulic pumping unit (fig. 3) is located on the right side of the launcher base. Major components of the pumping unit are shown on figures 120 and 121. Maintenance of the pumping unit consists of replacement of the hydraulic pumping unit assembly (C, fig. 122) and maintenance of individual components of the pumping unit assembly.

*Note.* The key letters shown in parentheses in a below refer to figure 122.

#### a. Hydraulic Pumping Unit Assembly.

*Note.* The extent of maintenance required on the hydraulic pumping unit assembly (C) determines whether it is necessary to remove it from the launcher base assembly (H).

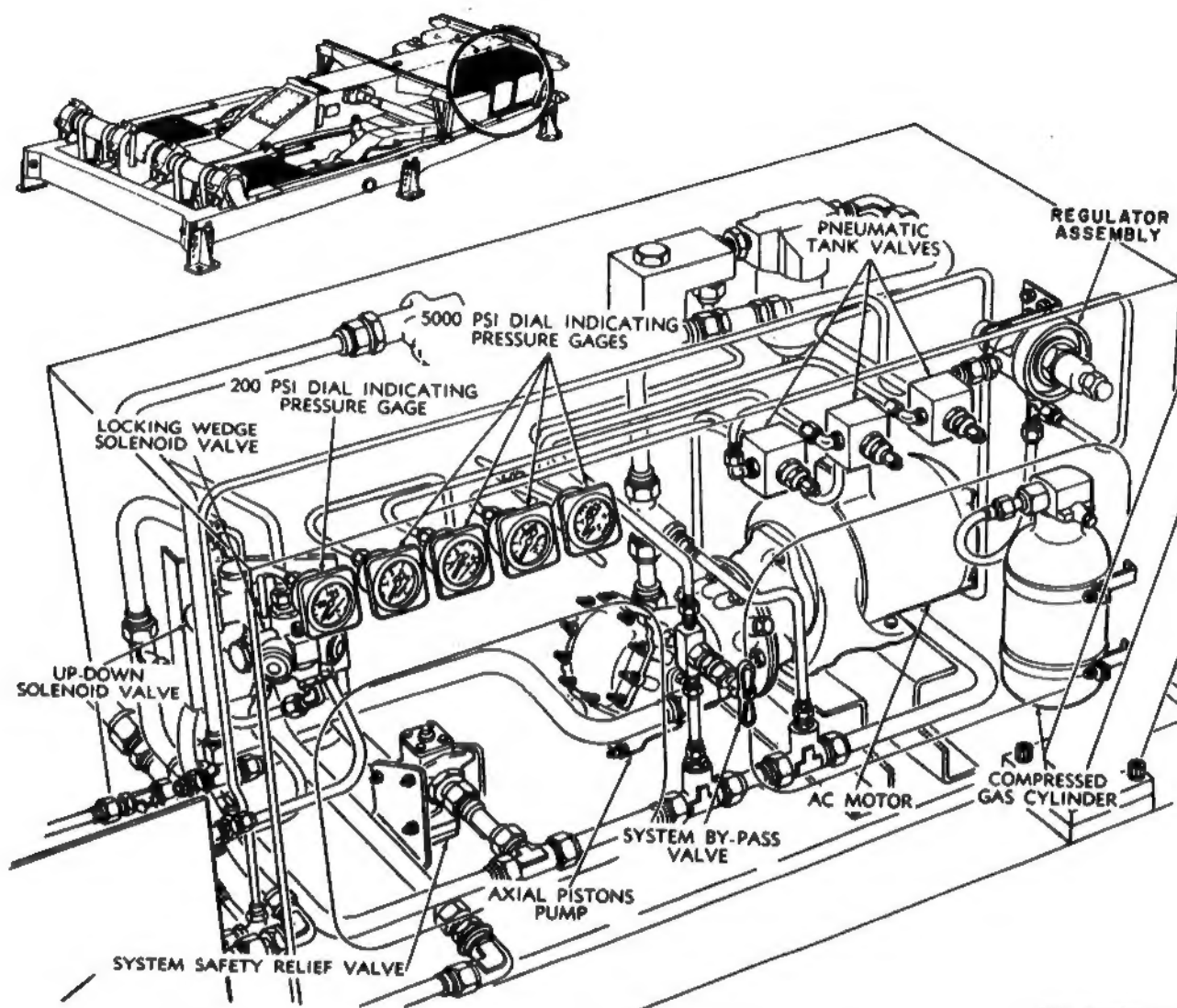


Figure 120. Hydraulic pumping unit—front view—location of major components.

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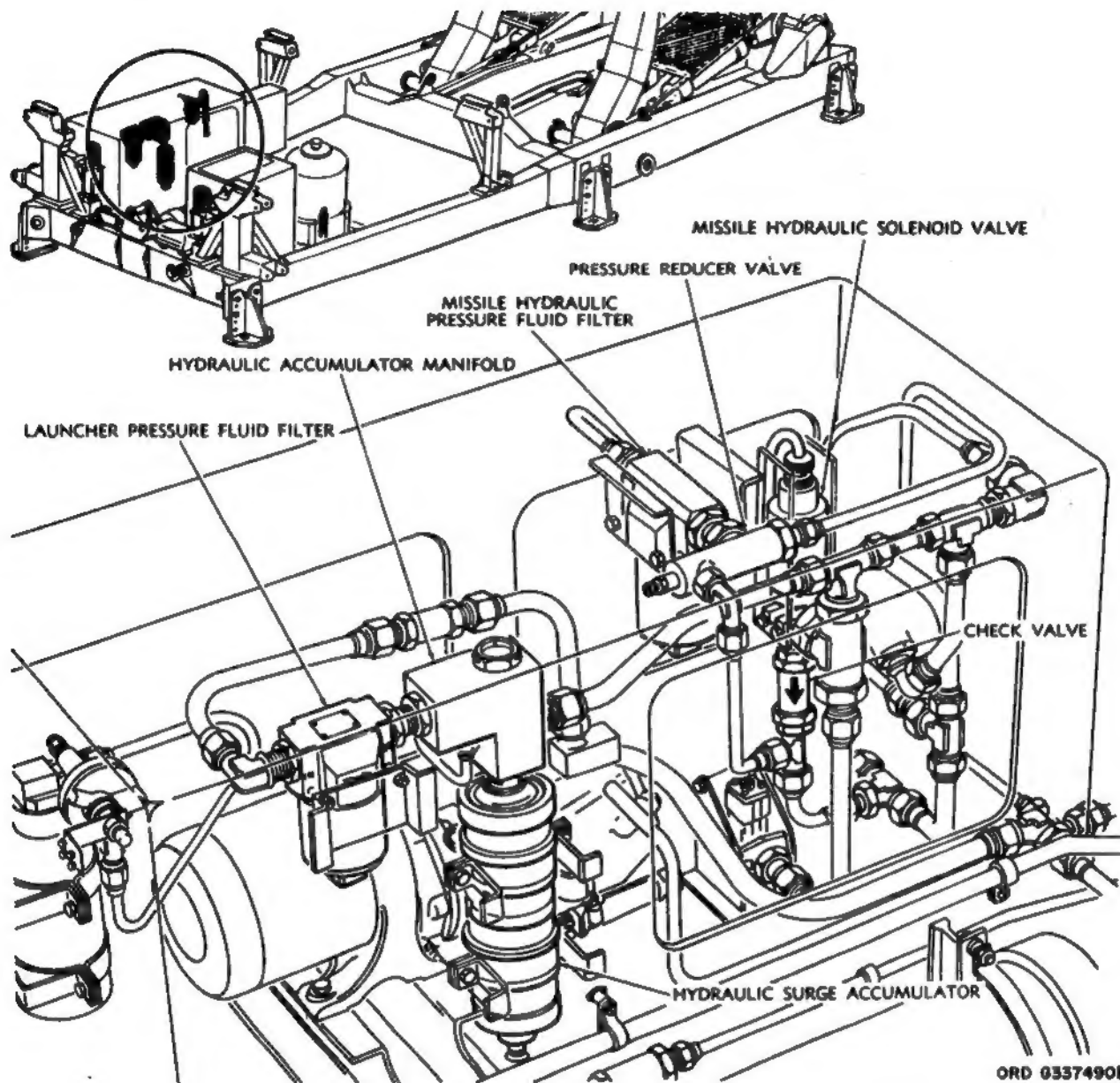
**Caution:** Be careful not to damage tube or pipe assemblies or their mating parts when removing or installing the hydraulic pumping unit assembly.

(1) *Removal.*

- (a) Raise the erecting beam to the up-and-locked position as outlined in paragraph 44.
- (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (c) Depressurize the hydraulic oil reservoir by turning the handle of the

plug cock to the VENT position and holding until all pressure is discharged.

- (d) Depressurize the equilibrator accumulator, the hydraulic surge accumulator, and the compressed gas cylinder as outlined in paragraph 41d.
- (e) Disconnect the cable assembly (AA), wiring harness assembly (Z), and all pipe and tube assemblies from the hydraulic pumping unit assembly.



■ *Figure 121. Hydraulic pumping unit—rear view—location of major components.*

- (f) Remove the clamps (V and W) securing the pipe assemblies.
  - (g) Remove the hexagon-head cap screws (B).
  - (h) Attach a lifting sling (D) capable of lifting a minimum of 200 pounds, to the D-rings (E) and remove the hydraulic pumping unit assembly from the launcher base assembly.
  - (i) Cap all open hydraulic lines.
- (2) *Troubleshooting.* Perform troubleshooting procedures for the hydraulic pumping unit assembly as outlined in table IX. ■
  - (3) *Installation.*
    - (a) Install the hydraulic pumping unit assembly by placing it in position in the launcher base assembly with the lifting sling.

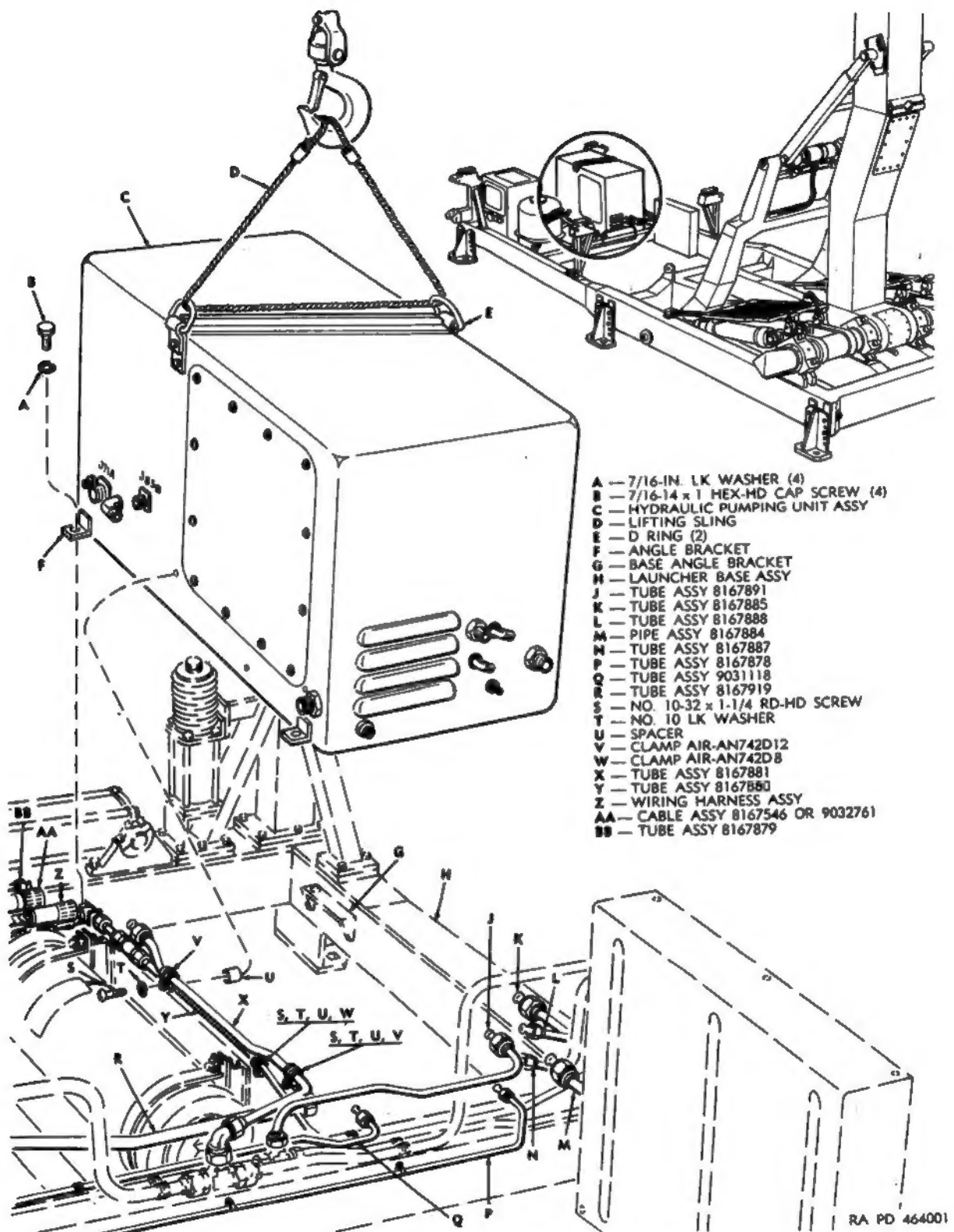


Figure 122. Hydraulic pumping unit assembly — removal and installation.

- (b) Install the four  $\frac{3}{16}$  in. lockwashers (A), the  $\frac{1}{4}$ -14 x 1 hexagon-head cap screws (B), and connect the cable assembly (AA), the wiring harness assembly (Z), and all tube and pipe assemblies. Torque coupling nuts to values specified below.

Tube and pipe assemblies	Torque value (pound-inches)
J	500
K	1000
L	300
M	1000
N	300
P	150
Q	300
R	1450
X	1000
Y	500
BB	150

- (c) Precharge the compressed gas cylinder, the hydraulic surge accumulator, the equilibrator accumulator, and the hydraulic oil reservoir as described in paragraph 40.
- (d) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.
- (e) Perform the launcher hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.

#### b. Hydraulic Pumping Unit Assembly Access Covers.

##### (1) Removal.

- (a) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.

- (b) Remove the three access covers (fig. 123) from the hydraulic pumping unit assembly.

- (2) *Disassembly.* Remove the rubber gaskets from the access cover assembly, the ventilatory cover assembly, and the hydraulic unit door assembly.

- (3) *Assembly.* Cement the rubber gaskets to their respective covers as described in paragraph 36b.

##### (4) Installation.

- (a) Position the access covers on the pumping unit assembly and secure them in position.
- (b) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.

#### c. Pressure Gage Access Door Assembly.

##### (1) Removal.

- (a) Remove the hydraulic unit door assembly (fig. 123).
- (b) Release the two studs (fig. 124) that secure the pressure gage access door assembly.
- (c) Remove the four round-head screws and hexagon nuts attaching the door assembly and remove door assembly.

##### (2) Disassembly.

- (a) Remove the pin, the two springs, and the hinge butt leaf.
- (b) Remove the studs by removing the split washers.

##### (3) Assembly.

- (a) Install and secure the studs with the split washers.
- (b) Position the hinge butt leaf, springs, and plate group and insert the pin.
- (c) Peen the hinge of the pressure gage access door assembly on both ends to retain the pin.

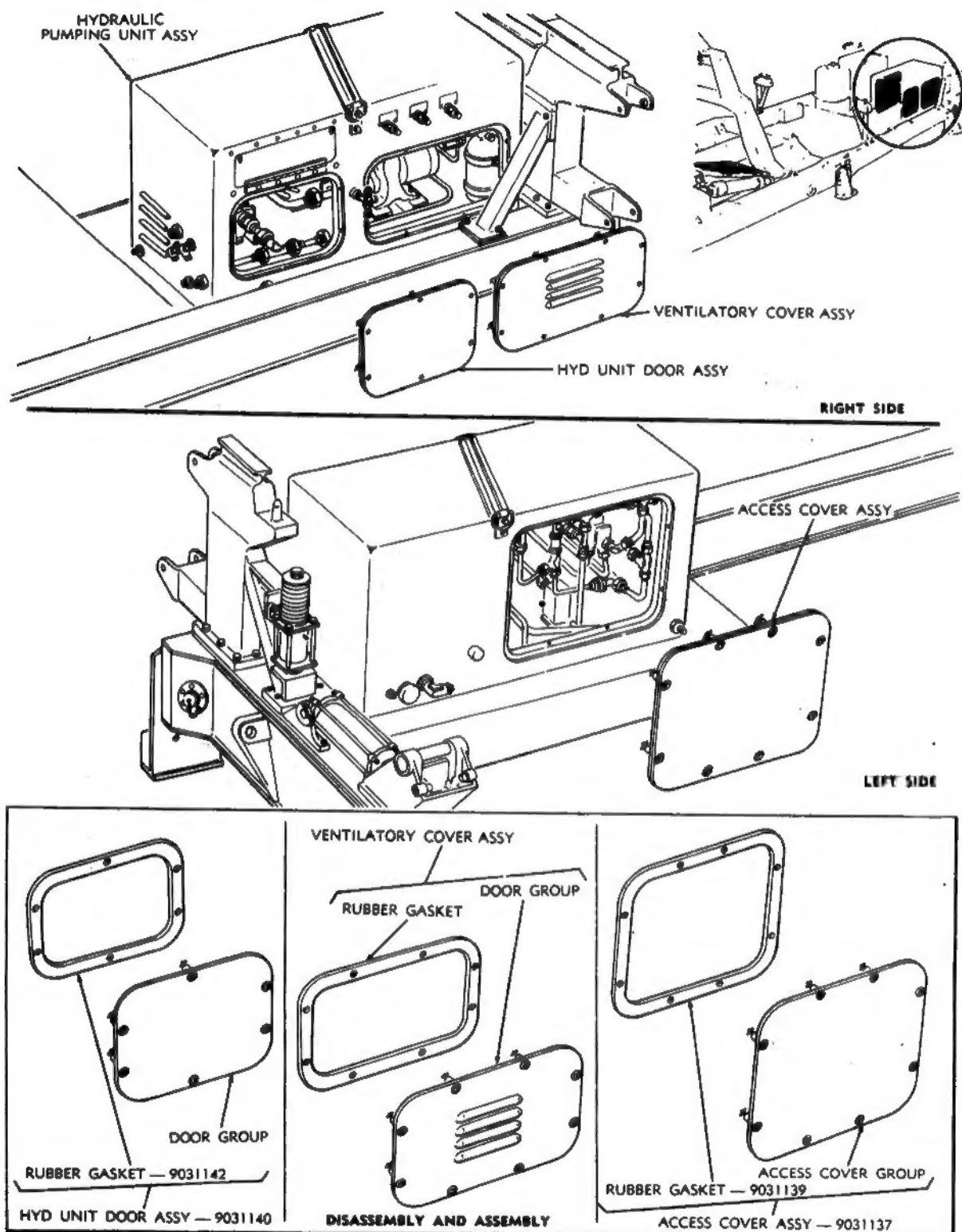
##### (4) Installation.

- (a) Install the door assembly.
- (b) Secure the door assembly with the two studs.
- (c) Install the hydraulic unit door assembly (fig. 123).

#### d. Axial Pistons Pump Group.

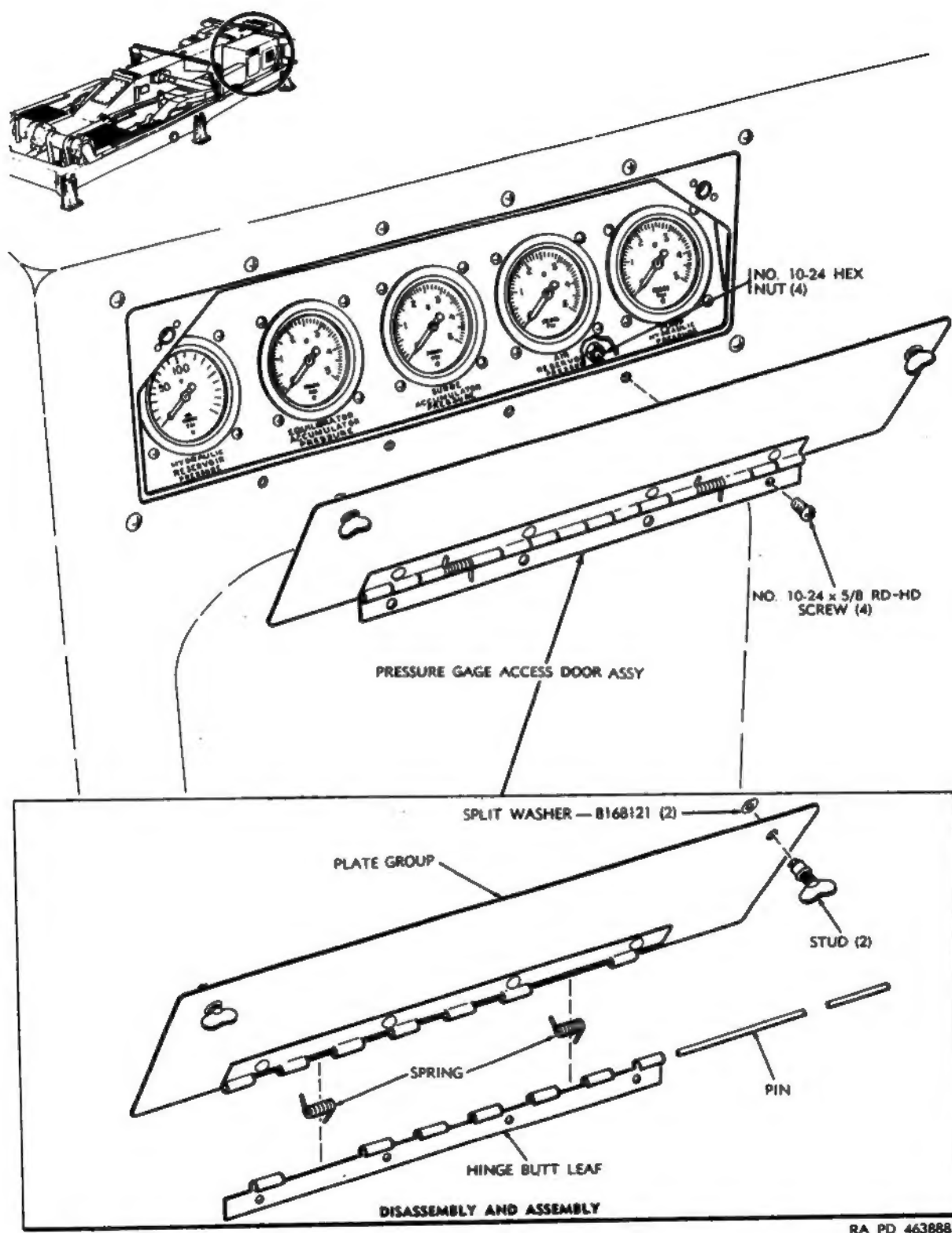
##### (1) Removal.

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.



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Figure 123. Hydraulic pumping unit assembly—access covers—removal and installation.



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Figure 124. Pressure-gage access door assembly—removal and installation.

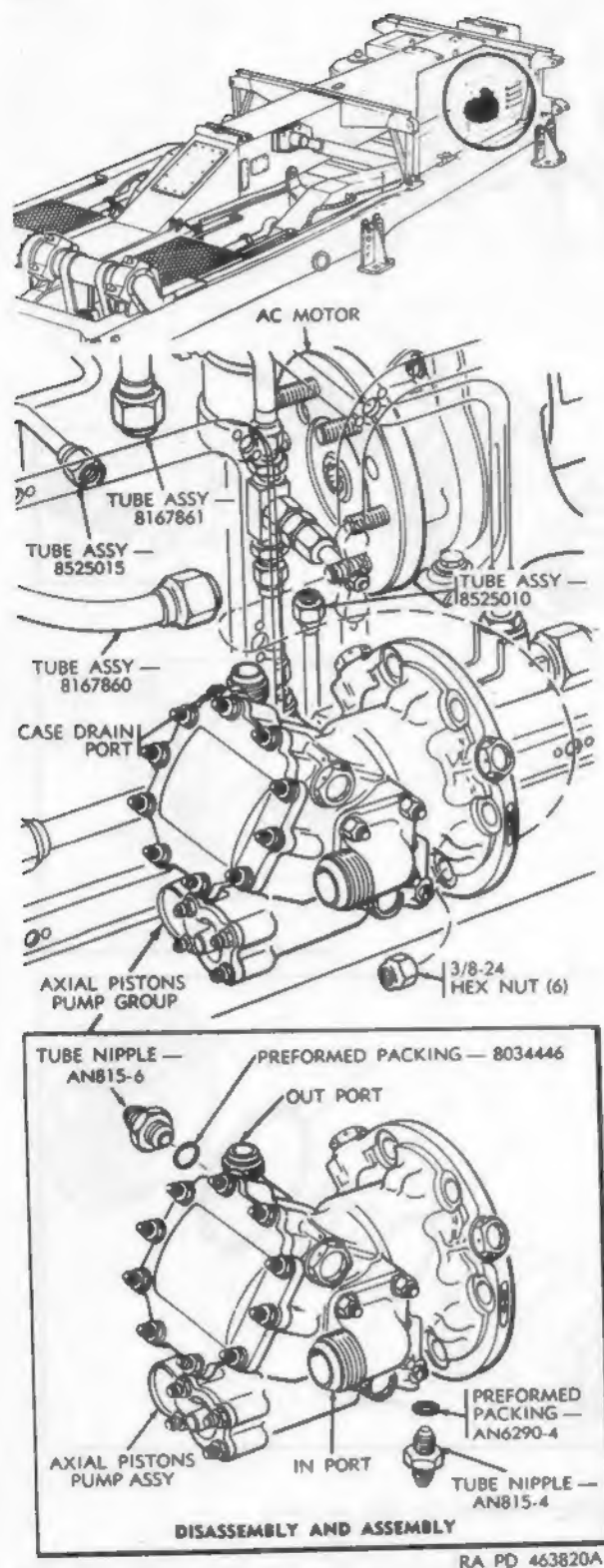


Figure 125. Axial pistons pump group—removal and installation.

- (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
  - (c) Remove the ventilatory cover assembly (fig. 123) and the hydraulic unit door assembly.
  - (d) Disconnect the four tube assemblies from the axial pistons pump group (fig. 125).
  - (e) Remove the pump group by removing the six hexagon nuts attaching pump group to the ac motor; cap all open hydraulic lines.
- (2) *Disassembly.*
- (a) Drain all oil from the pump assembly.
  - (b) Remove the two tube nipples and two preformed packings from the pistons pump assembly.
  - (c) Remove the socket-head cap screw (L, fig. 126) and remove spur gear shaft assembly (M, fig. 126).
  - (d) Remove preformed packing (M2, fig. 126) from the spur gear-shaft (M1, fig. 126).
  - (e) Remove the pump cover and inspection plug (fig. 127).
  - (f) Remove the link pin retaining ring (R, fig. 128).
  - (g) Insert a No. 4-40NC screw into the tapped, headless grooved pin (S, fig. 128) and pull out pin to disengage the linkage of the swivel yoke (J, fig. 126) from the pistons control group (T, fig. 128).

**Caution:** Maintain a tight grip on the pistons control group while removing the mounting hexagon nuts (U, fig. 128). A heavy compression spring within the control group may cause the parts to fly apart if not kept under control.

- (h) Stand the pump assembly on its mounting flange end, remove the four hexagon nuts (U, fig. 128) and lift control group out of the pump assembly.

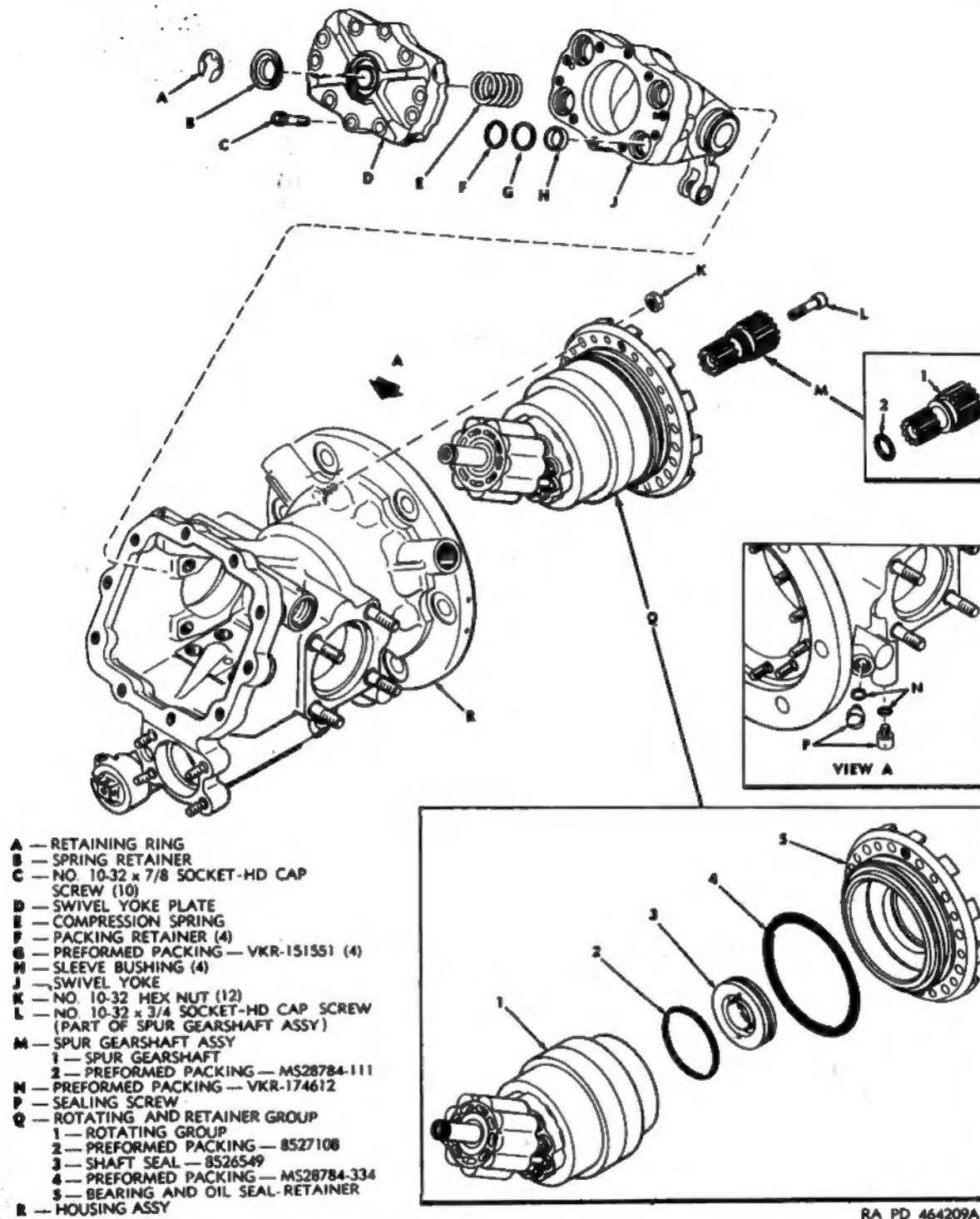
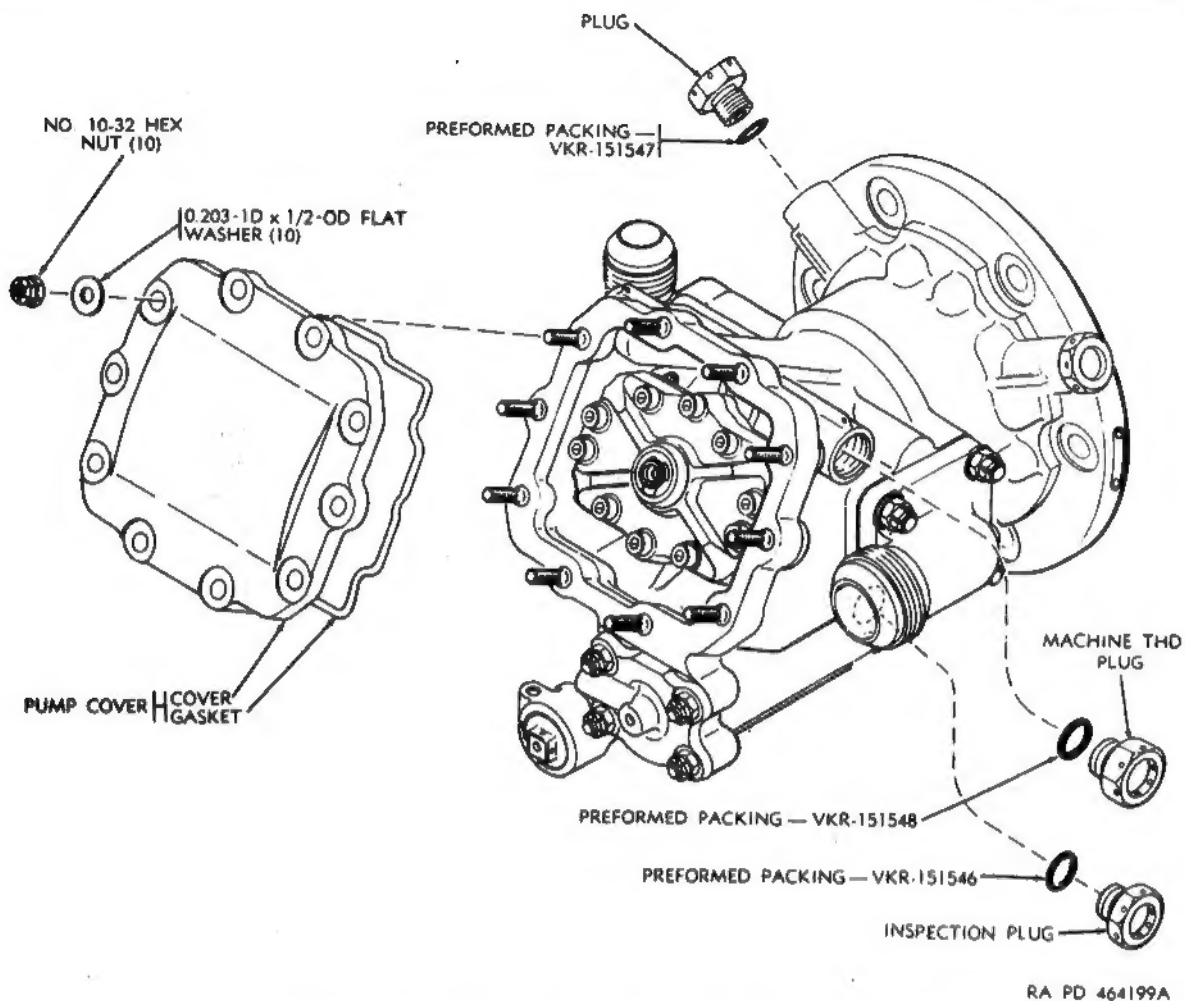


Figure 126. Axial piston pump assembly—disassembly and assembly.

1. *Disassembly of the control group.*  
Disassemble control group.
2. *Assembly of the control group.*  
Assemble control group.

- (i) Remove the hexagon nuts (K, fig. 126) from bearing and oil seal retainer (Q5, fig. 126).



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Figure 127. Axial piston pump assembly—disassembly and assembly—continued.

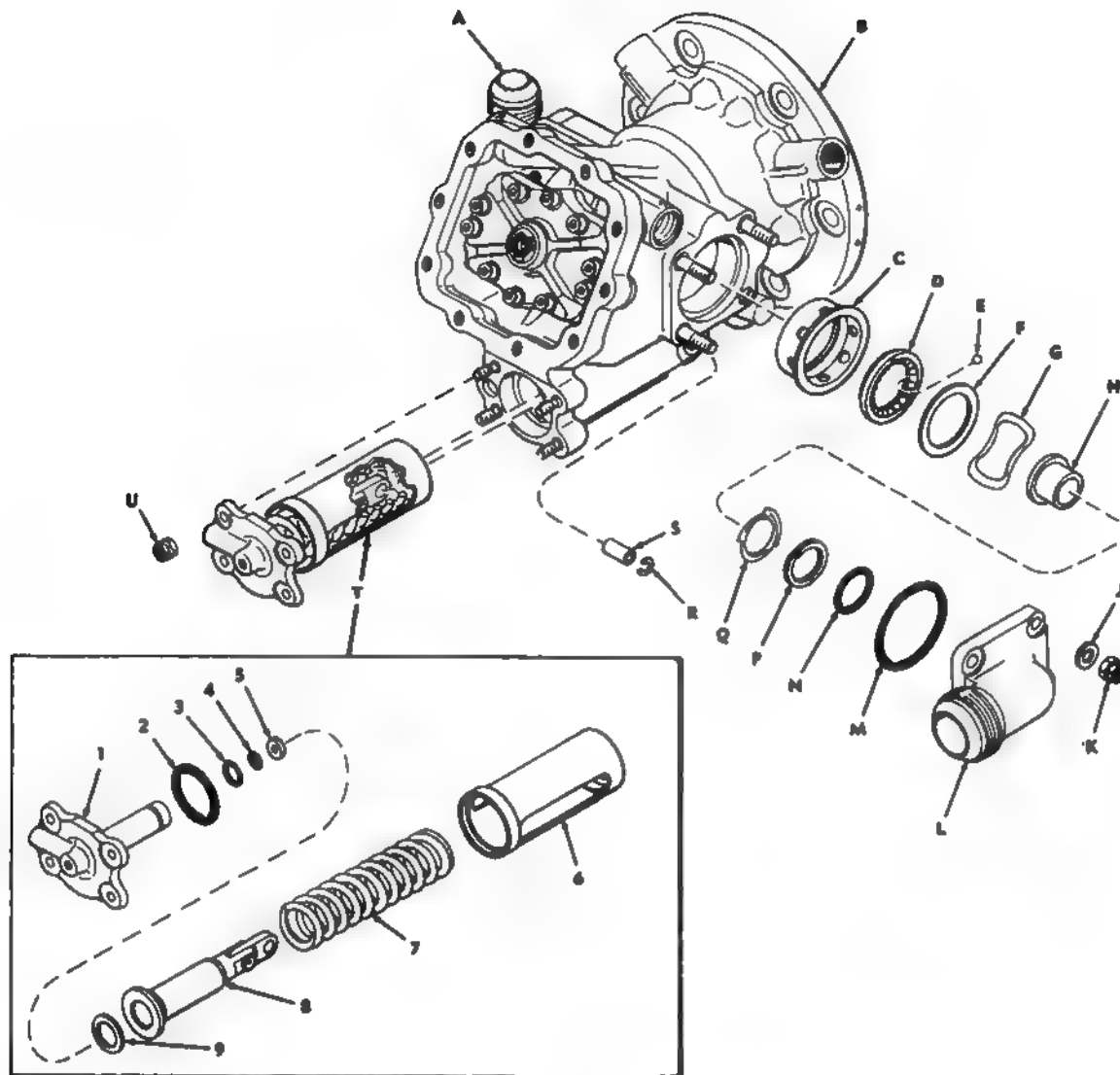
**Notes.** Do not attempt to remove the oil seal retainer at this time.

- (j) Insert a No. 10-24NC screw (A, fig. 129) into the threaded cylinder bearing pin and remove the retaining ring.

**Caution:** A seal between two finely machined surfaces must be broken in the following step. If this seal is not broken, the piston cylinder manifold may adhere to the yoke plate and become disengaged from the remainder of the rotating and retainer group, resulting in damage to the pistons.

- (k) Break the seal between the piston cylinder manifold (fig. 130), the yoke plate (D, fig. 126), and face of swivel yoke (J, fig. 126) by holding the cylinder bearing pin (B, fig. 129) down while removing the yoke plate.
- (l) Remove the swivel yoke plate (D, fig. 126).

**Caution:** Do not tilt the bearing and oil seal container (Q5, fig. 126) in the sleeve of the housing assembly (R, fig. 126) during removal in the following step.



A — OUTLET FLANGE  
 B — HOUSING ASSY  
 C — PINTLE BEARING RETAINER  
 D — PINTLE BEARING RACE  
 E — BALL BEARING (22)  
 F — FLAT WASHER  
 G — SPRING TENSION WASHER  
 H — SLEEVE BUSHING  
 J — 17/64 ID x 1/2 OD FLAT WASHER  
 K — 1/4-28 HEX NUT (4)  
 L — INLET FLANGE  
 M — PREFORMED PACKING — VKR-151130  
 N — PREFORMED PACKING — VKR-151549  
 P — PACKING RETAINER — MS28782-15  
 Q — FINGER WASHER SPRING

R — LINK PIN RETAINING RING  
 S — 0.250 x 0.562 LG HEADLESS GROOVED PIN  
 T — PISTONS CONTROL GROUP  
 1 — PRESSURE CONTROL CYLINDER MANIFOLD  
 2 — PREFORMED PACKING — VKR-151123  
 3 — PREFORMED PACKING — MS28784-12  
 4 — PREFORMED PACKING — VKR-174624  
 5 — PACKING RETAINER — VKR-176076  
 6 — SPRING RETAINER ASSY  
 7 — COMPRESSION SPRING  
 8 — PRESSURE CONTROL CYLINDER ASSY  
 9 — 33/64 ID x 3/4 OD x .046 THK FLAT WASHER  
 U — NO 10-32 HEX NUT (4)

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**Figure 128. Axial piston pump assembly—disassembly and assembly—continued.**

(m) Remove the rotating and retainer group (B, fig. 129) by lifting the housing while holding the rotating

and retainer group down with the thumbs.

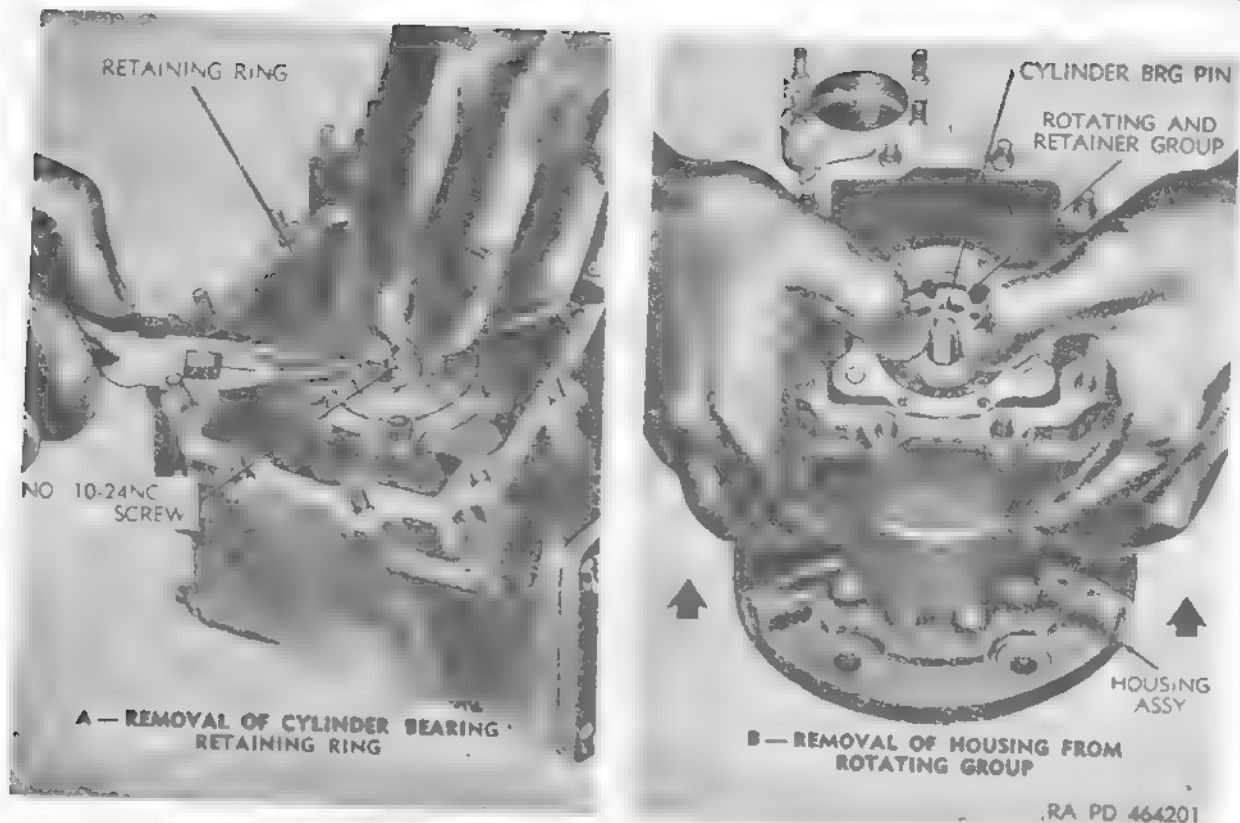


Figure 129. Axial pistons pump assembly—disassembly and assembly—continued.

**Caution:** Do not tilt oil seal retainer or rotating group when performing the following step.

- (n) Separate the rotating group (Q1, fig. 126) from the oil seal retainer (Q5, fig. 126).

*Note.* If disassembly of the rotating group is necessary, perform steps (o) through (ag) below. If this disassembly is not required, omit steps (o) through (ag) and proceed with step (ah).

**Caution:** The following operation must be done with care in order to keep the pistons from becoming damaged by stroking against each other.

- (o) Hold the rotating group (Q1, fig. 126) firmly (shaft end down), grasp the piston cylinder manifold (fig. 130) and gently pull it straight up and off the shaft, piston, and bearing group.
- (p) Separate the knuckle link and pins group and the floating bearing

from the bore of the shaft, piston, and bearing group.

- (q) Remove the four knuckles from the connecting link.
- (r) Compress the retainer ring and remove the connecting link retainer from the piston cylinder manifold; remove retainer ring from link retainer.
- (s) Remove the cylinder bearing pin and bearing assembly, the cylinder block bearing spring retainer, and the cylinder block bearing spring from the piston cylinder manifold. This can be done by placing the end of the cylinder bearing pin and bearing on a smooth surface and applying a slight downward pressure on the piston cylinder manifold.
- (t) Clean, inspect, and lubricate as prescribed in (3), (4)(d), and (5) below.

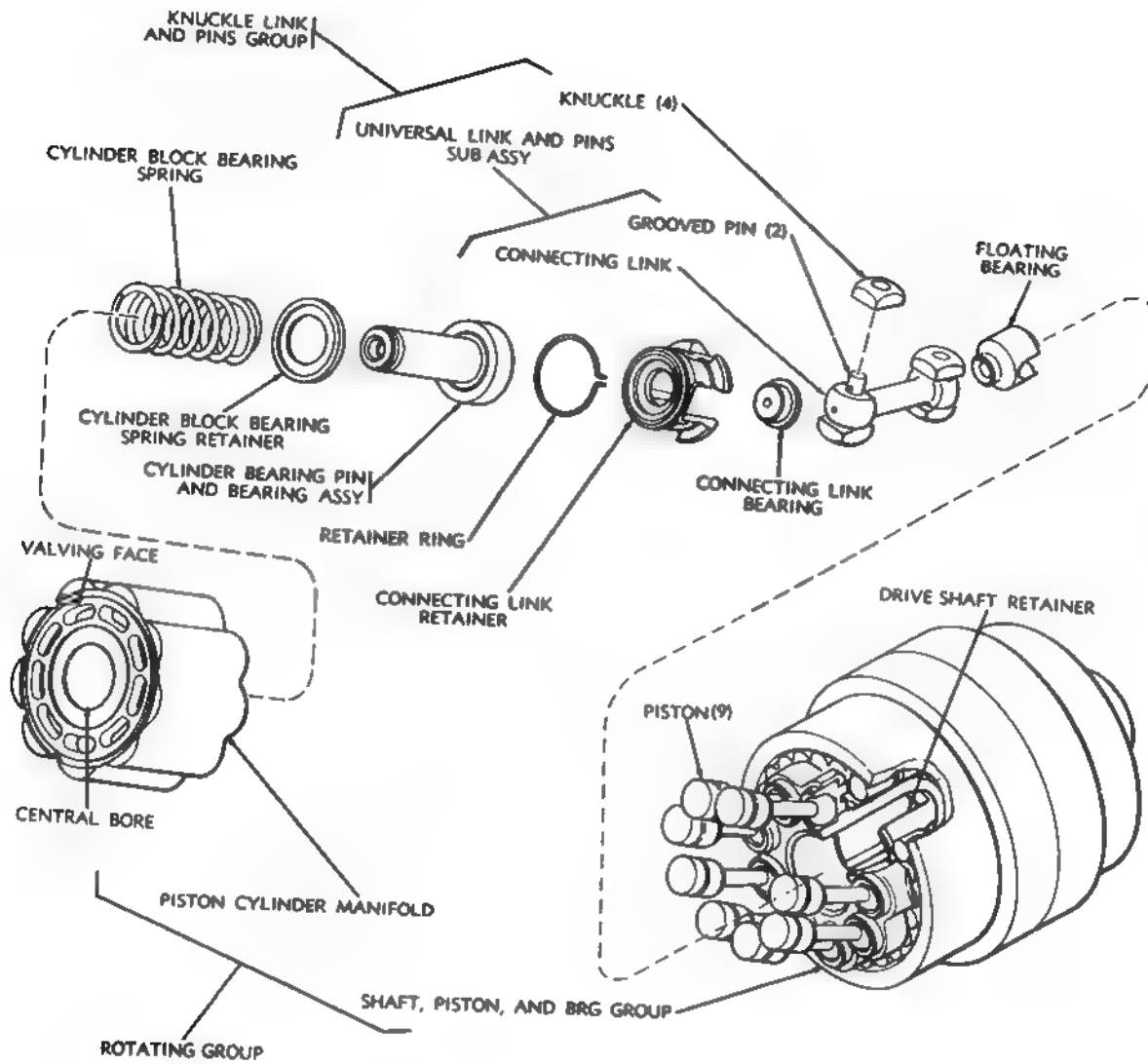


Figure 180. Rotating group—disassembly and assembly.

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**Caution:** Before continuing disassembly of the pump assembly, reassemble the rotating group as described in (u) through (ag) below. This will prevent possible damage to internal parts of the rotating group during disassembly of the pump assembly in (ah) through (an) below.

- (u) Place two small wood blocks about ½-inch apart. Lay the piston cylinder manifold down so that the central bore (fig. 130) of the manifold (valving-face down) is over the space between the wooden blocks.
- (v) Drop the spring into the central bore and follow it by the spring retainer, recessed end first.
- (w) Insert the cylinder bearing pin and bearing assembly in the bore, pin first, so that the pin protrudes through the face of the manifold.
- (x) Install the retainer ring around the recess in the connecting link retainer, with the ears of the retainer ring against the flat surface of the link retainer.
- (y) Compress the retainer ring and place the link retainer in the central bore of the manifold so that the ears of the manifold hold the retainer ring in place.
- (z) Lock the link retainer in the manifold by pushing the link retainer down with a twisting motion and seating it solidly between the ears of the manifold.
- (aa) Assemble the four knuckles to the connecting link and position them on their respective grooved pins with the grooved ends of the knuckles facing toward the link ends.
- (ab) Holding the link at an angle, slide one of the knuckles into its slot in the drive shaft retainer. Repeat for the other knuckle.
- (ac) Holding the manifold over this partial assembly, carefully insert num-

ber one piston into number one cylinder bore.

**Note.** The number one piston is the piston which aligns with both slots of the drive shaft retainer. The number one cylinder bore is the bore which aligns with both slots of the connecting link retainer.

- (ad) Continue inserting pistons into their respective cylinder bores alternately on either side of number one piston and bore.
- (ae) When only two pistons remain outside of their bores, spread the pistons apart and, holding the manifold at an angle, guide knuckles of the universal link and pins subassembly into the connecting link retainer, with the grooved ends of the knuckles facing the manifold.
- (af) Insert the remaining two pistons in their bores.

**Caution:** While performing the tests described in the following step, do not allow the knuckles to slip out of slots of link retainer.

- (ag) After the rotating group is completely assembled, check it for freedom of movement and smoothness of operation. Push the manifold downward several times and allow it to return to its original position by action of the bearing spring. Move the manifold around in a circle while holding the flange of the shaft, piston and bearing group firmly in one hand. The action should be smooth and without binding of any kind.
- (ah) Press the shaft seal (Q3, fig. 126) from the bearing and oil seal retainer (Q5) and remove preformed packings (Q2 and Q4).

**Note.** The key letters shown in parentheses in (ai) through (an) below refer to figure 128.

- (ai) Remove the four hexagon nuts (K)

and flat washers (J), and remove the inlet flange (L).

**Caution:** Extreme care should be used when handling the sleeve bushing in the following step, to prevent damage to its lapped face.

- (aj) Remove the sleeve bushing (H) and finger washer spring (Q).
- (ak) Remove the spring tension washer (G) and flat washer (F).
- (al) Grasp the housing firmly in both hands and shake the 22 ball bearings (E) out of the pintle bearing race (D).
- (am) Remove the race (D) and the pintle bearing retainer (C).
- (an) Removal of the outlet flange (A) is identical to removal of the inlet flange (L). To remove the outlet flange, repeat steps (ai) through (am) above.
- (3) *Cleaning.* After the pump has been disassembled, wash all parts, except packings, gaskets, and preformed packings in clean dry-cleaning solvent-6850-227-1860. Rinse all parts carefully and blow out all passages with compressed air, filtered to remove moisture.
- (4) *Inspection.*
  - (a) *Housing assembly* (R, fig. 126).
    1. Check all flanges and mounting bosses for damage or distortion.
    2. Check all studs and tapped holes for stripped threads.
    3. Check the pump cover (fig. 127) to make sure it is flat and undistorted.
  - (b) *Flanges* (fig. 126).
    1. Inspect the finger washer springs (Q) for damage or deformation.
    2. Make certain the ball bearings (E) are round, clean, and in good condition.
    3. Check that the seating surfaces of

the inlet flange (L) and outlet flange (A) are smooth and flat.

- (c) *Bearing and oil seal retainer* (Q5, fig. 126).

1. Inspect the inside and outside diameters of the collar of the retainer for damage.
2. Check the gasket recess of the retainer for smoothness.

- (d) *Rotating group* (Q1, 126).

**Note.** Any irreparable damage to the manifold (fig. 130) or the pistons requires replacement of the complete rotating group. This is because each piston is individually fitted to its respective cylinder bore and the parts are, therefore, not interchangeable.

1. Inspect the pistons for scratches, nicks, or scores.
2. Make certain the connecting rods of the pistons turn freely.
3. Check each piston for the absence of end play by pushing it back and forth. There must be no end play.
4. Insert any piston into its corresponding bore in the manifold. While holding a finger on the port of the manifold, pull the piston out of the bore with a quick movement. A definite "pop" should be heard which indicates acceptable tolerances for proper operation.
5. Inspect the manifold for scored or out-of-round cylinder bores.
- (e) *Knuckle link and pins group* (fig. 130).
  1. Inspect the grooved pins to assure that they are in line and parallel to one another.
  2. With the four knuckles installed on the grooved pins, make certain the knuckles rotate freely with no evidence of play on the pins.
  3. Inspect the knuckles for wear or roughness.

4. Inspect the connecting link retainer for signs of wear.
  5. With the connecting link, four knuckles, link retainer and drive shaft retainer assembled, turn the link retainer to check for the absence of play. There must be no play.
  6. Inspect the connecting link bearing and floating bearing for an out-of-round condition.
- (f) *Miscellaneous parts.* Check the remaining miscellaneous parts of the pump assembly for general condition and replace any damaged parts.
- (5) *Lubrication.* After the component parts of the pump assembly have been thoroughly cleaned, inspected, and repaired or replaced, they should be rinsed in clean hydraulic fluid as specified in paragraph 37a prior to reassembly. This serves to protect and lubricate the parts.
- (6) *Assembly.*
- Note.* The key letters shown in parentheses in (a) through (g) below refer to figure 126.
- (a) Make certain the spring retainer (B) is properly seated in the eccentric grooves around the sides of the swivel yoke plate (D).
  - (b) Assemble the sleeve bushings (H), preformed packings (G), and packing retainers (F) on the swivel yoke (J) and position the swivel yoke plate (D) on the swivel yoke with the bearing shaft of the rotating group (Q1) through the swivel yoke plate.
  - (c) Install swivel yoke plate with ten No. 10-32 x  $\frac{3}{4}$  socket-head cap screws (C), tightening screws alternately to assure even seating of plate, and lockwire with 0.025-inch lockwire.
  - (d) Assemble the parts of the rotating and retainer group (Q) and make certain the rotating group (Q1) is firmly seated in the bearing and oil seal retainer (Q5).
  - (e) Grasp the housing assembly (R) and lower it over the rotating and retainer group (Q) so that the outside of the rotating and retainer group will slip into the sleeve inside the housing assembly.
- Caution:* The shaft, piston, and bearing group (fig. 130) fits tightly in the sleeve. Be extremely careful not to allow the bearing group to become tilted. If it does, remove the bearing group and start over again. Do not use force.
- (f) Keeping the piston cylinder manifold (fig. 130) in position on the pistons of the bearing group, slide the housing assembly (R) down around the rotating and retainer group (Q) until the preformed packing (Q4) around the seal retainer (Q5) offers some resistance.
  - (g) Apply enough weight to the housing assembly (R) to overcome the resistance of the preformed packing (Q4), and seat the seal retainer (Q5) in the housing assembly.
- Note.* Do not secure the seal retainer to the housing assembly at this time.
- (h) Insert a No. 10-24NC screw (A, fig. 129) into the end of the cylinder bearing pin.
  - (i) Pull up on the screw, insert the retaining ring, and remove the screw.
  - (j) Install the rotating and retainer group (Q, fig. 126) with No. 10-32 hexagon nuts (K, fig. 126).
  - (k) Install the pistons control group (T, fig. 128).
  - (l) Holding the control group down tightly, start the No. 10-32 hexagon nuts (U, fig. 128) and secure

them alternately so as to seat the control group evenly in the housing assembly.

*Note.* Make certain the control group is installed so that the link of the pressure control cylinder assembly (T8, fig. 128) is adjacent to the arm of the swivel yoke (J, fig. 126) and on the side of the arm away from the hole for the inspection plug (fig. 127).

- (m) Insert a No. 4-40NC screw into the tapped, headless grooved pin (S, fig. 128).
- (n) Align the link of the pressure control cylinder assembly (T8, fig. 128) and arm holes of the swivel yoke (J, fig. 126) and insert the pin through the swivel yoke and link.

*Note.* The key letters shown in parentheses in (o) through (x) below refer to figure 128 unless otherwise indicated.

- (o) Secure the pin (S) in the swivel yoke with the link pin retaining ring (R) and remove screw.
- (p) Install the pump cover (fig. 127) and cover gasket. Tighten the No. 10-32 hexagon nuts equally to avoid distorting the pump cover.
- (q) Install the pintle bearing retainer (C), being careful not to tilt retainer.
- (r) Gently tap the pintle bearing race (D) into the retainer, making sure it bottoms firmly.
- (s) Install the 22 ball bearings (E) into the bearing race.
- (t) Install the flat washer (F) and spring tension washer (G), respectively, over the ball bearings.

**Caution:** The outer faces of the pintles on the swivel yoke (J, fig. 126) and the sleeve bushing (H) are lapped to form leakproof seals with each other. Use caution not to damage these sealing surfaces.

- (u) Insert preformed packing (N) in the inlet flange (L).
- (v) Install the finger washer spring (Q) followed by the packing retainer (P).
- (w) Install preformed packing (M) and install inlet flange (L).
- (x) Assemble and install the outlet flange (A) by repeating steps (q) through (w) above.
- (y) Apply graphite grease—9150-223-4001 to the inner (small) end of the spur gear shaft assembly (M, fig. 126).
- (z) Install preformed packing (M2, fig. 126) and insert the gear shaft assembly in the inner end of the rotating and retainer group (Q, fig. 126).
- (aa) Install No. 10-32 x  $\frac{1}{4}$  socket-head cap screw (L, fig. 126).
- (ab) Install plugs, machine thread plug, and inspection plug on the pump assembly (fig. 127).
- (ac) Install tube nipples on the pump assembly (fig. 125).

#### (7) Installation.

- (a) Prime and lubricate the pump group by pouring hydraulic fluid specified in paragraph 37a into the IN port and the case drain port of the pump group.
- (b) Attach the pump group to the ac motor with six  $\frac{1}{4}$ -24 hexagon nuts.
- (c) Connect the tube assemblies to the pump group and torque coupling nuts to values specified below:

Tube assembly	Torque value (pound-inches)
8525015	300
8167861	1000
8167860	1450
8525010	150

- (d) Close the EQUILIBRATOR SYSTEM BYPASS valve (fig. 60).

- (e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
  - (f) Place the launcher control-indicator MISSILE HYDR switch to the ON position and operate the axial pistons pump assembly for one minute.
  - (g) Place the MISSILE HYDR switch to the OFF position and close the SYSTEM BY-PASS valve.
- (8) *Inspection and test.*
- (a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 125) as described in w (1) below.
  - (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
  - (c) Replace all defective parts and install tube assembly as described in (7) (c) through (g) above.
  - (d) Install the ventilatory cover assembly fig. 123 and the hydraulic unit door assembly.
- e. *Up-Down Solenoid Valve Group.*
- (1) *Removal.*
- (a) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.
  - (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
  - (c) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
  - (d) Remove access cover assembly (fig. 123).
  - (e) Disconnect cable assembly from up-down solenoid valve group (fig. 131).
  - (f) Disconnect and cap four attaching tube assemblies.
  - (g) Remove valve group by removing four hexagon nuts, flat washers, and hexagon-head bolts.
- (2) *Disassembly.*
- (a) Disassemble the valve group.
  - (b) Disassemble the valve assembly.
- (3) *Assembly.*
- (a) Assemble the up-down solenoid valve assembly.
  - (b) Assemble the up-down solenoid valve group.
- (4) *Installation.*
- (a) Install valve group.
  - (b) Connect four attaching tube assemblies and torque coupling nuts to 1000 pound-inches.
  - (c) Connect cable assembly.
  - (d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
  - (e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
  - (f) Perform the launcher hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.
- (5) *Inspection and test.*
- (a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 131) as described in w (1) below.
  - (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
  - (c) Replace all defective parts and install tube assembly as described in w (2) below.
  - (d) Install access cover assembly (fig. 123).

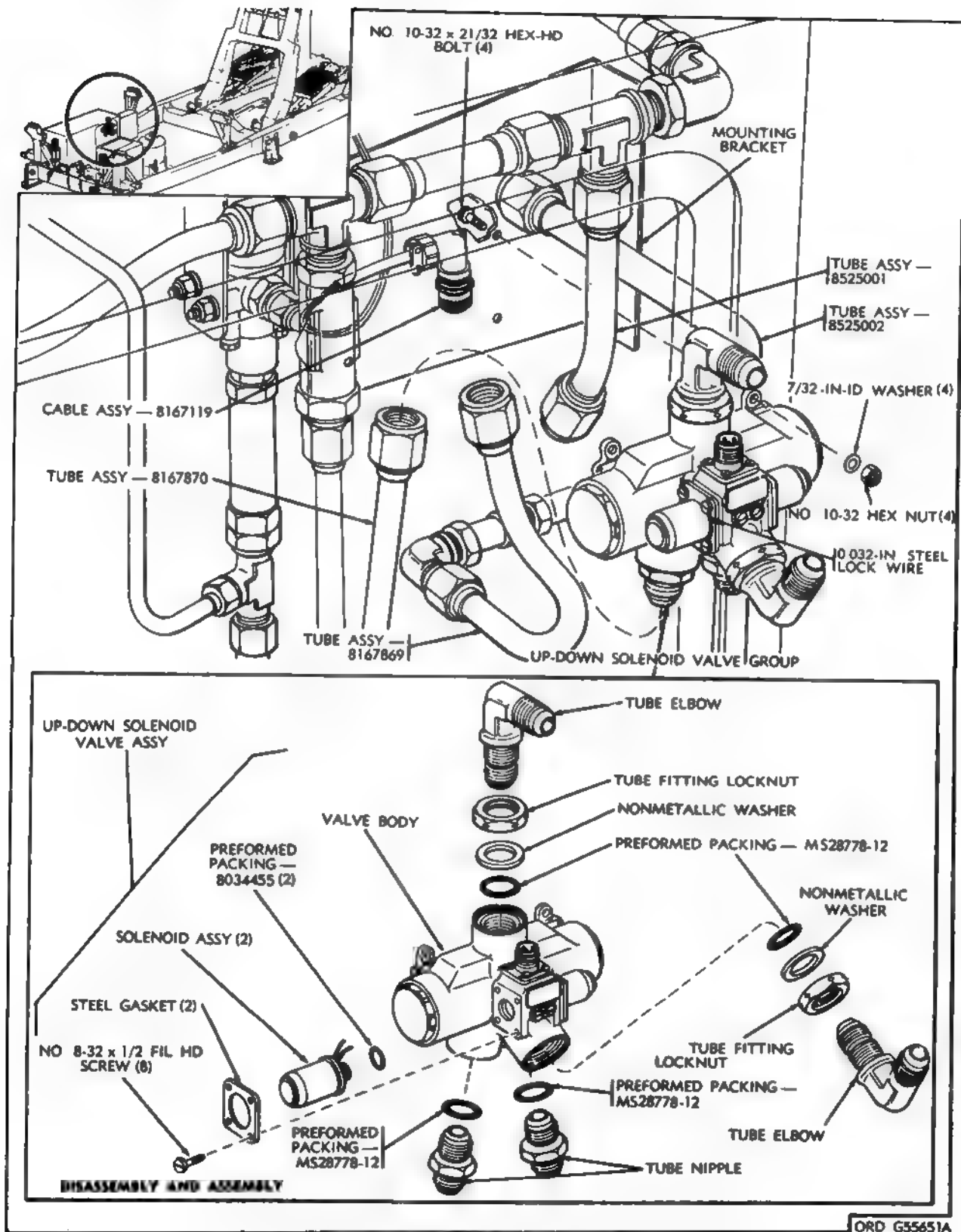


Figure 131. Up-down solenoid valve group—removal and installation.

- (e) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

*f. Locking Wedge Solenoid Valve Group.*

(1) *Removal.*

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (c) Remove hydraulic unit door assembly (fig. 123).
- (d) Disconnect cable assembly (fig. 132).
- (e) Disconnect and cap four attaching tube assemblies.
- (f) Remove solenoid valve group.

(2) *Disassemble (fig. 133).*

- (a) Loosen tube fitting locknut and remove tube elbow, nonmetallic washer, preformed packing and locknut.
- (b) Remove tube reducers, tube nipple, and preformed packings.

**Caution:** Plug to be removed in the following step is under spring tension. Do not release plug until spring tension has been expended.

- (c) Remove plug, packing retainer, preformed packings, valve spring retainers, spring, and shuttle and sleeve assembly.
- (d) Remove bushing, solenoid coil, and associated parts.
- (e) Remove connector receptacle.

(3) *Assembly.*

- (a) Assemble locking wedge solenoid valve assembly and valve group.
- (b) Refer to TM 9-1440-250-35 and make proper wiring connections

between solenoid coil and connector receptacle.

(4) *Installation.*

- (a) Install valve group (fig. 132) on mounting bracket.
- (b) Connect cable assembly.
- (c) Connect four attaching tube assemblies and torque coupling nuts to values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167866	500
8167867	300
8167868	300
8525000	500

- (d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) *Inspection and test.*

- (a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 132) as described in *w* (1) below.
- (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
- (c) Replace all defective parts and install tube assembly as described in *w* (2) below.
- (d) Install hydraulic unit door assembly (fig. 123).

*g. Missile Hydraulic Solenoid Valve Group.*

(1) *Removal.*

- (a) Raise the erecting beam to the up-and-locked position as described in paragraph 44.
- (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

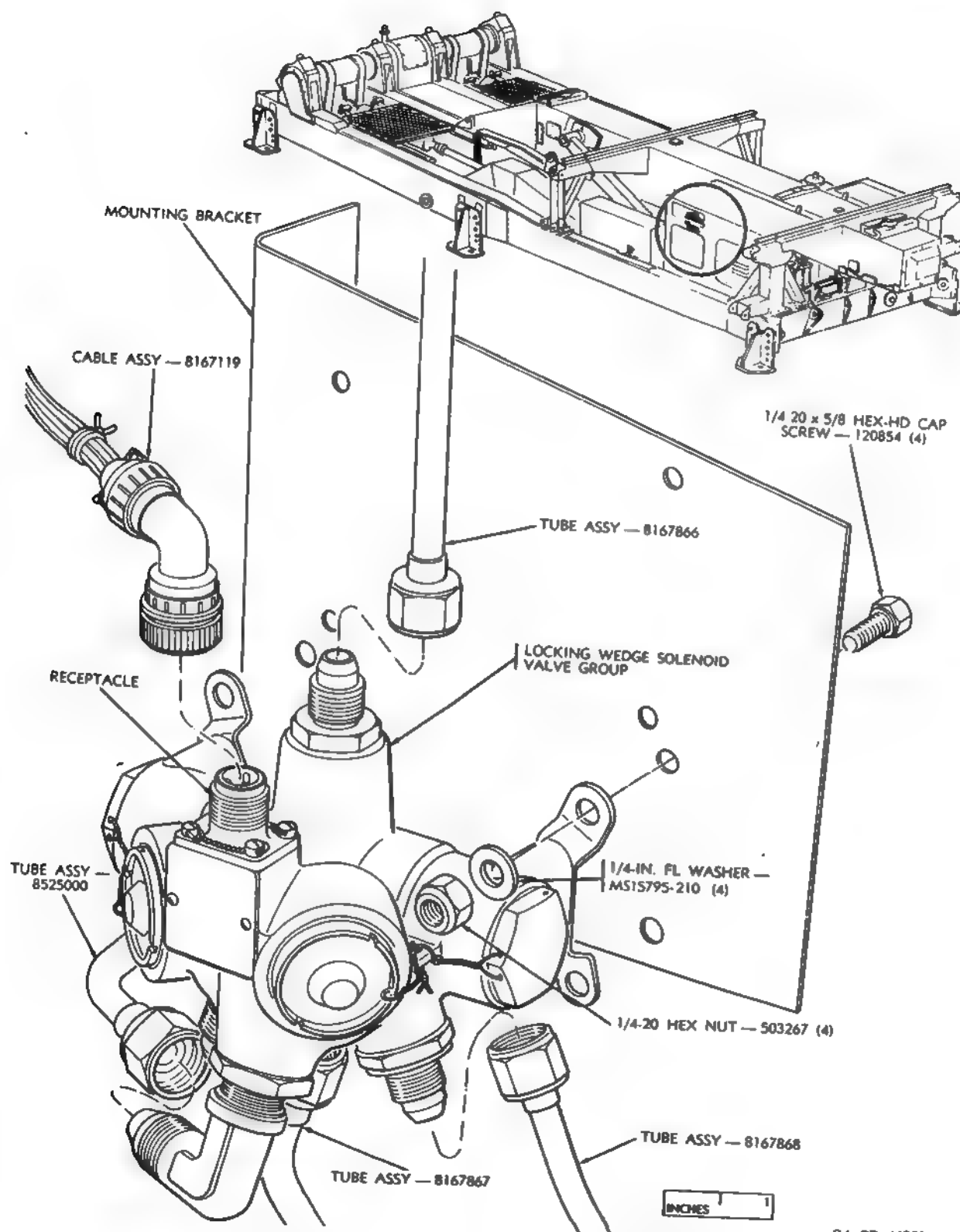
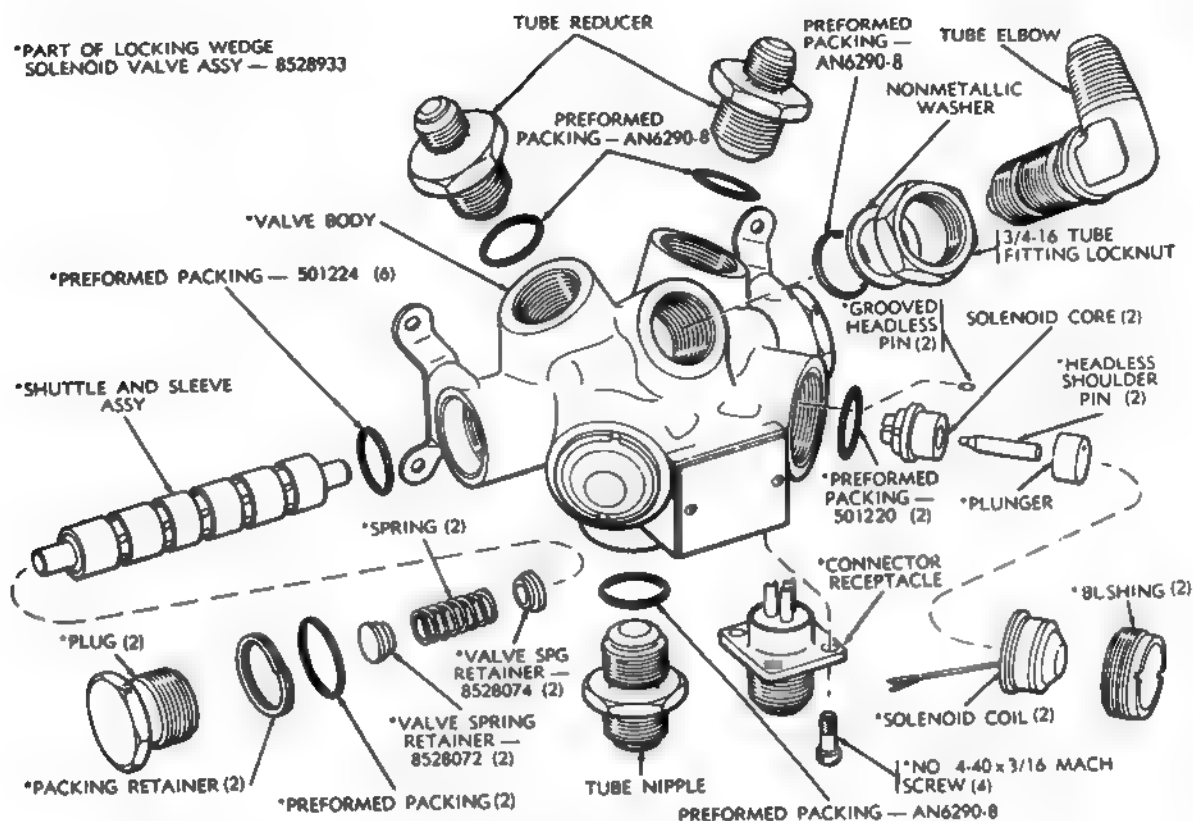


Figure 132. Locking wedge solenoid valve group - removal and installation.

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**Figure 133. Locking wedge solenoid valve group—disassembly and assembly.**

- (c) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
  - (d) Remove the access cover assembly (fig. 123).
  - (e) Disconnect cable assembly (fig. 134) from receptacle.
  - (f) Disconnect and cap six attaching tube assemblies.
  - (g) Remove missile hydraulic solenoid valve group.

(2) *Disassembly.* Disassemble the valve group (fig. 135) and valve assembly.

(3) *Assembly.*

  - (a) Assemble the missile hydraulic solenoid valve assembly and valve group.
  - (b) Lockwire four screws with 0.032-inch steel lockwire (fig. 134).

(4) *Installation.*

  - (a) Install valve group on mounting bracket.
  - (b) Connect cable assembly.
  - (c) Connect six attaching tube assemblies and torque coupling nuts to values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167865	1000
8525014	1000
8525013	300
8524747	300
8167864	1000
8525011	500

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167865	1000
8525014	1000
8525013	300
8524747	300
8167864	1000
8525011	500

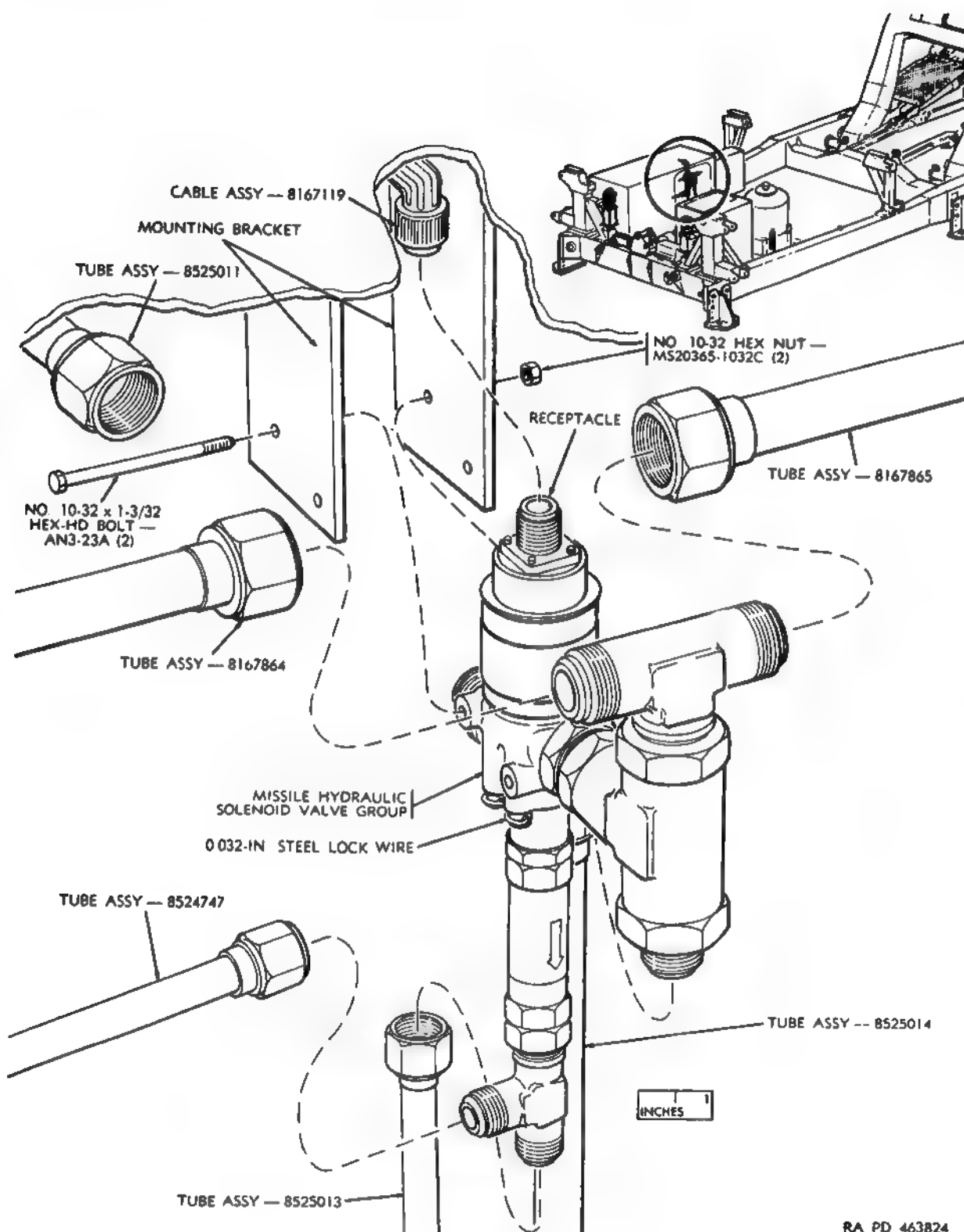


Figure 134. Missile hydraulic solenoid valve group — removal and installation.

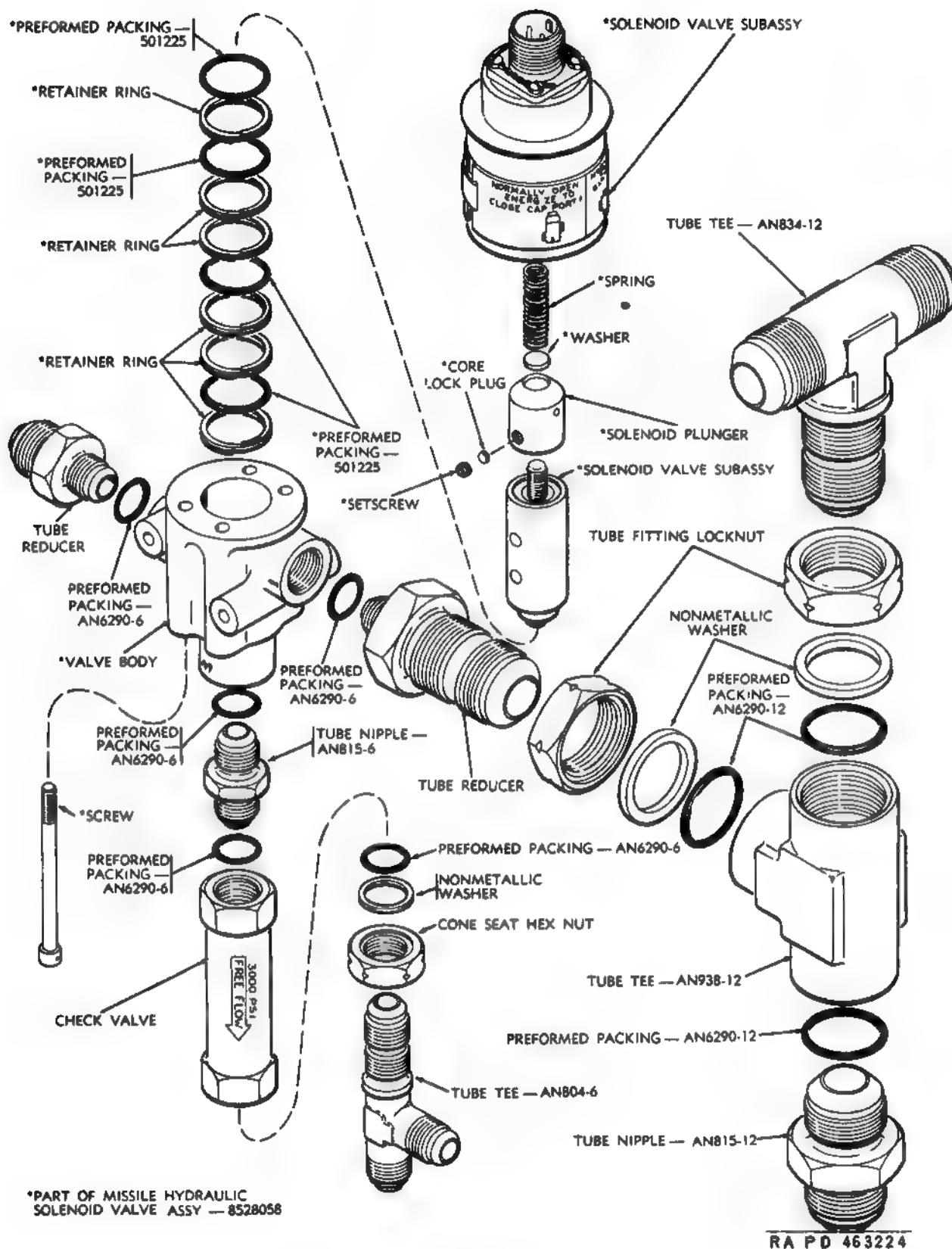


Figure 135. Missile hydraulic solenoid valve group—disassembly and assembly.

- (d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (5) *Inspection and test.*
  - (a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 134) as described in *w(1)* below.
  - (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
  - (c) Replace all defective parts and install tube assembly as described in *w(2)* below.
  - (d) Install access cover assembly (fig. 123).
  - (e) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.
- h. System Safety Relief Valve Group.*
  - (1) *Removal.*
    - (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
    - (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
    - (c) Remove the hydraulic unit door assembly (fig. 123).
    - (d) Disconnect and cap two attaching tube assemblies (fig. 136).
    - (e) Remove system safety relief valve group.
  - (2) *Disassembly.* Disassemble valve group.
  - (3) *Assembly.* Assemble system safety relief valve group.
- (4) *Installation.*
  - (a) Position and install valve group on mounting brackets.
  - (b) Connect two attaching tube assemblies and torque coupling nuts to 1000 pound-inches.
  - (c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
  - (d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
  - (e) Perform the launcher hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.
- (5) *Inspection and test.*
  - (a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 136) as described in *w(1)* below.
  - (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
  - (c) Replace all defective parts and install tube assembly as described in *w(2)* below.
  - (d) Install the hydraulic unit door assembly (fig. 123).
- i. Air Pressure Regulating Valve Group.*
  - (1) *Removal.*
    - (a) Remove ventilatory cover assembly (fig. 123).
    - (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

**Warning:** To prevent possible injury to personnel from pressure escaping from compressed gas cylinder assembly, make certain the following step is performed:

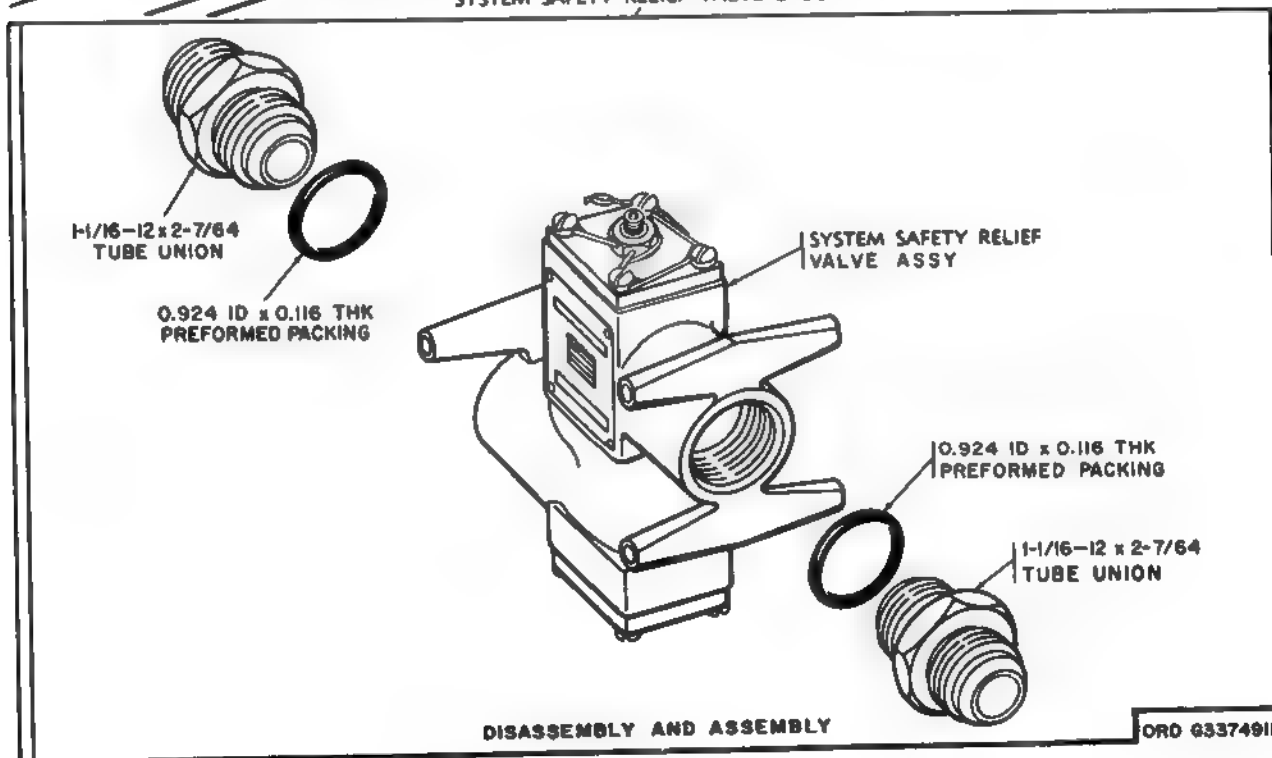
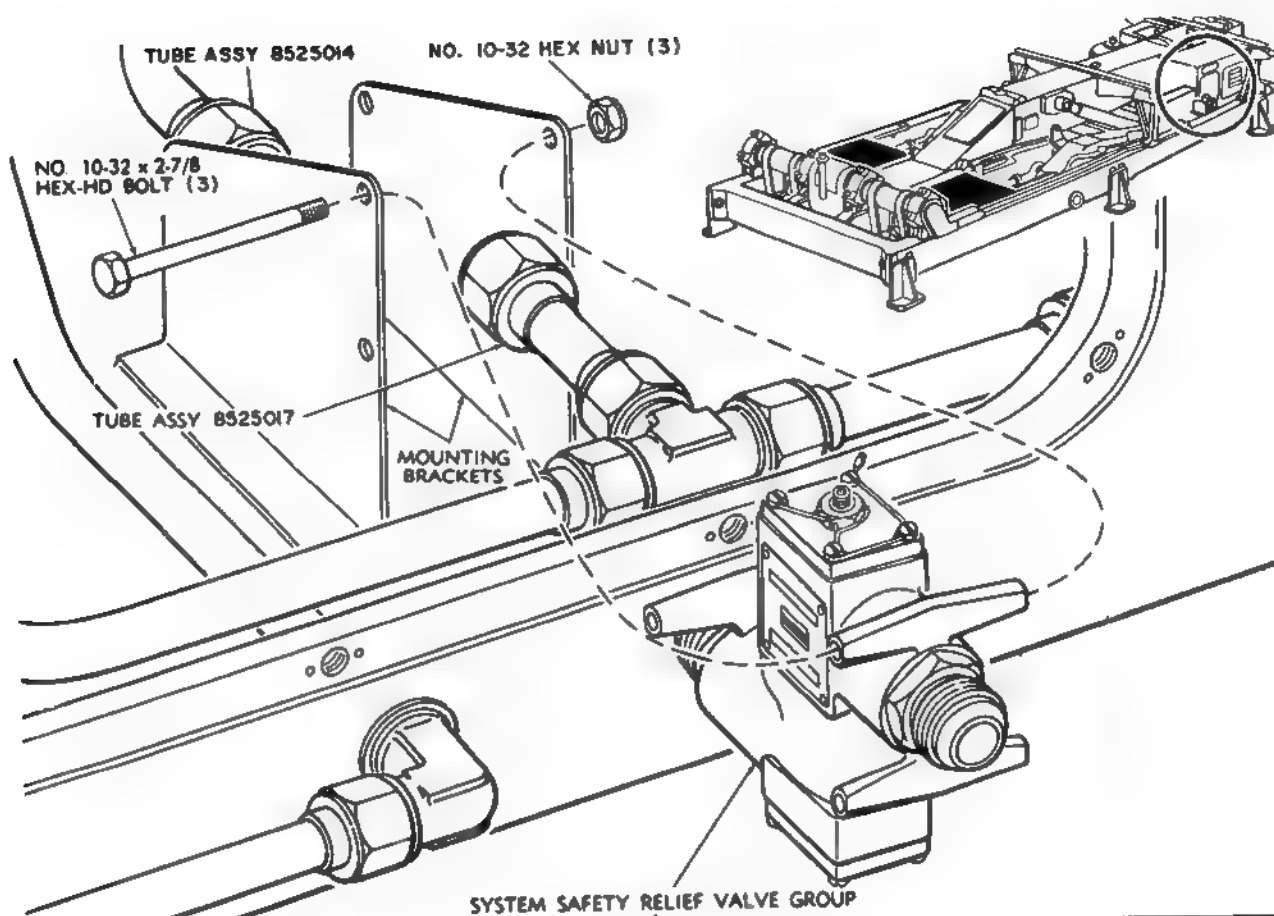


Figure 136. System safety relief valve group - removal and installation.

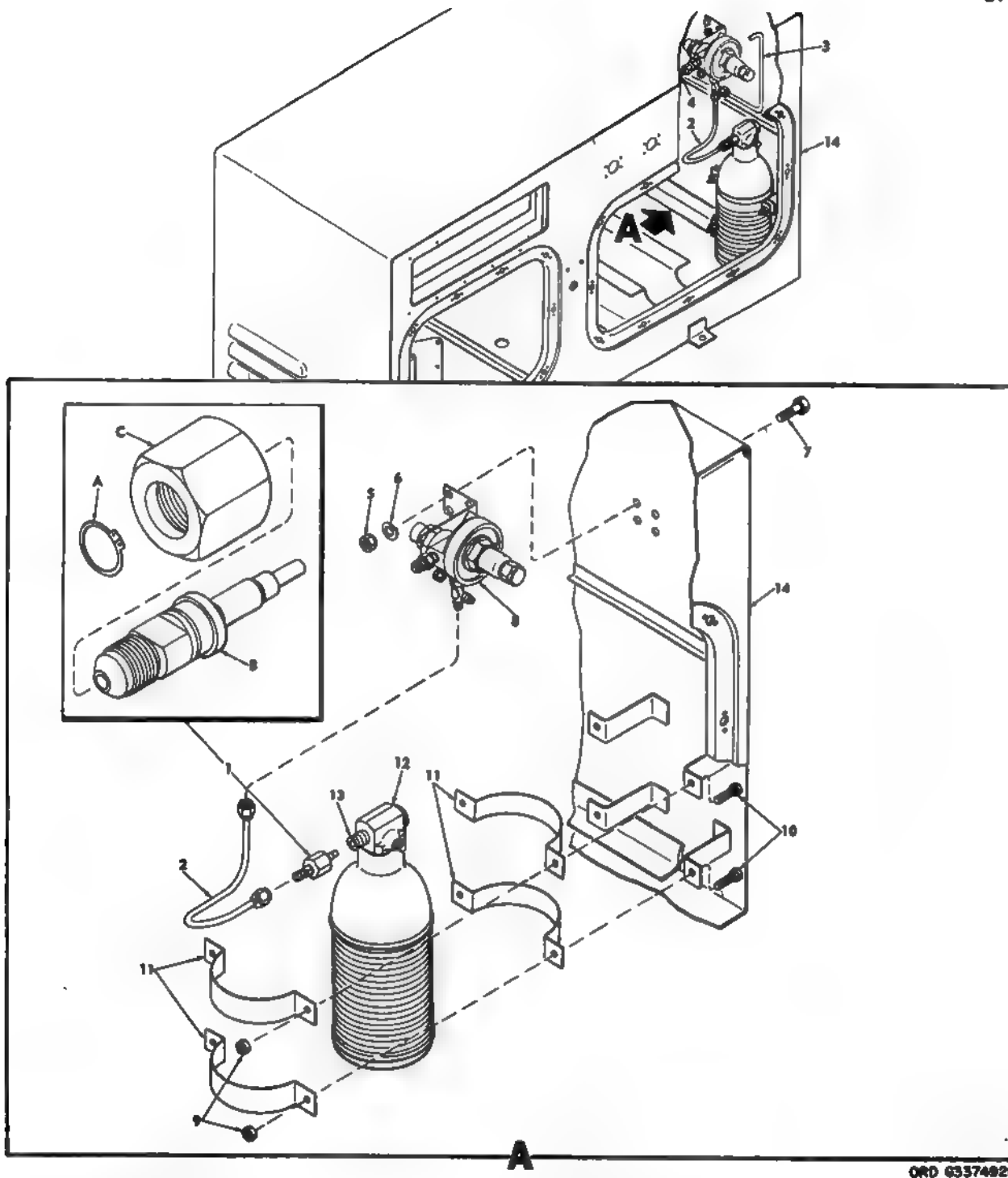


Figure 137. Regulator assembly and compressed gas cylinder assembly—removal and installation.

- (c) Disconnect the tube coupling nut assembly (1, fig. 137) from the compressed gas cylinder assembly (12).
- (d) Disconnect the three tube assemblies (2, 3 and 4) attached to the regulator assembly (8).
- (e) Remove the regulator assembly and cap all open hydraulic lines.

(2) *Installation.*

*Figure 138. (Deleted)*

- (a) Secure the regulator assembly (8, fig. 137) to the hydraulic pumping unit assembly (14) with the hexagon-head screws, lockwashers and hexagon nuts (7, 6, and 5).
- (b) Connect the tube assemblies (2, 3 and 4) to the regulator assembly; torque the tube assembly coupling nuts to the values specified in table XII.
- (c) Connect the tube coupling nut assembly (1) to the compressed gas cylinder assembly (12); torque the coupling nut (1C) to 150 pound-inches.

*Note.* When the tube coupling nut assembly is tightened against the air outlet (13), gas will flow from the gas cylinder assembly to the regulator assembly.

- (d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

*Subparagraphs (3)&(4). (Deleted)*

(5) *Inspection and test.*

- (a) Check all connections for air leakage; if there are any leaks, remove the attaching tube assembly (2, 3 or 4, fig. 137) as outlined in *w* (1) below.
- (b) Check the tube and coupling nut and the mating part which attaches to the tube assembly for damage or deformation.
- (c) Replace all defective parts and install the tube assembly as outlined in *w* (2) below.
- (d) Install the ventilatory cover assembly (fig. 123).

*j. Compressed Gas Cylinder Assembly.*

(1) *Removal.*

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (b) Depressurize the compressed gas cylinder assembly as outlined in paragraph 41d.
- (c) Remove the ventilatory cover assembly (fig. 123).

**Warning:** The compressed gas cylinder assembly (12, fig. 137) may still contain compressed gas. To prevent bodily injury to personnel by escaping gas, close the air outlet (13) of the cylinder assembly by performing step (d) below.

- (d) Leaving the tube assembly (2) attached to the tube coupling nut assembly (1), completely disconnect the tube coupling nut assembly from the air outlet.
- (e) Remove the tube coupling nut assembly from the tube assembly.
- (f) Remove the cylinder assembly and the clamps (11).

*Note.* The compressed gas cylinder assembly must be subjected to hydrostatic testing in accordance with TB 742-93-1, every two years or at any time a cylinder shows any evidence of bad dents, corroded areas, leakage or other conditions that indicate a weakness which might render the cylinder unsafe.

(2) *Disassembly.*

**Warning:** The compressed gas cylinder assembly may still contain compressed gas. To prevent bodily injury to personnel, do not stand in front of the bleed plug when releasing the air from the gas cylinder in (a) below.

- (a) Loosen the bleed plug (A9, fig. 139) a three-quarter turn.
- (b) Remove the check valve assembly (A) from the compressed gas cylinder (D).
- (c) Disassemble the check valve assembly.

(3) *Assembly.*

- (a) Assemble the check valve assembly (A).
- (b) Install the preformed packing (B) and metal hose assembly (C) on the valve assembly.
- (c) Install the valve assembly on the compressed gas cylinder (D).

(4) *Installation.*

- (a) Install the clamps (11, fig. 137) and the compressed gas cylinder assembly (12).
- (b) Connect the tube assembly (2) to the tube coupling nut assembly (1); connect the coupling nut assembly to the gas cylinder assembly; torque the coupling nut assembly to 150 pound-inches.
- (c) Precharge the gas cylinder assembly as outlined in paragraph 40.
- (d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(5) *Inspection and test.*

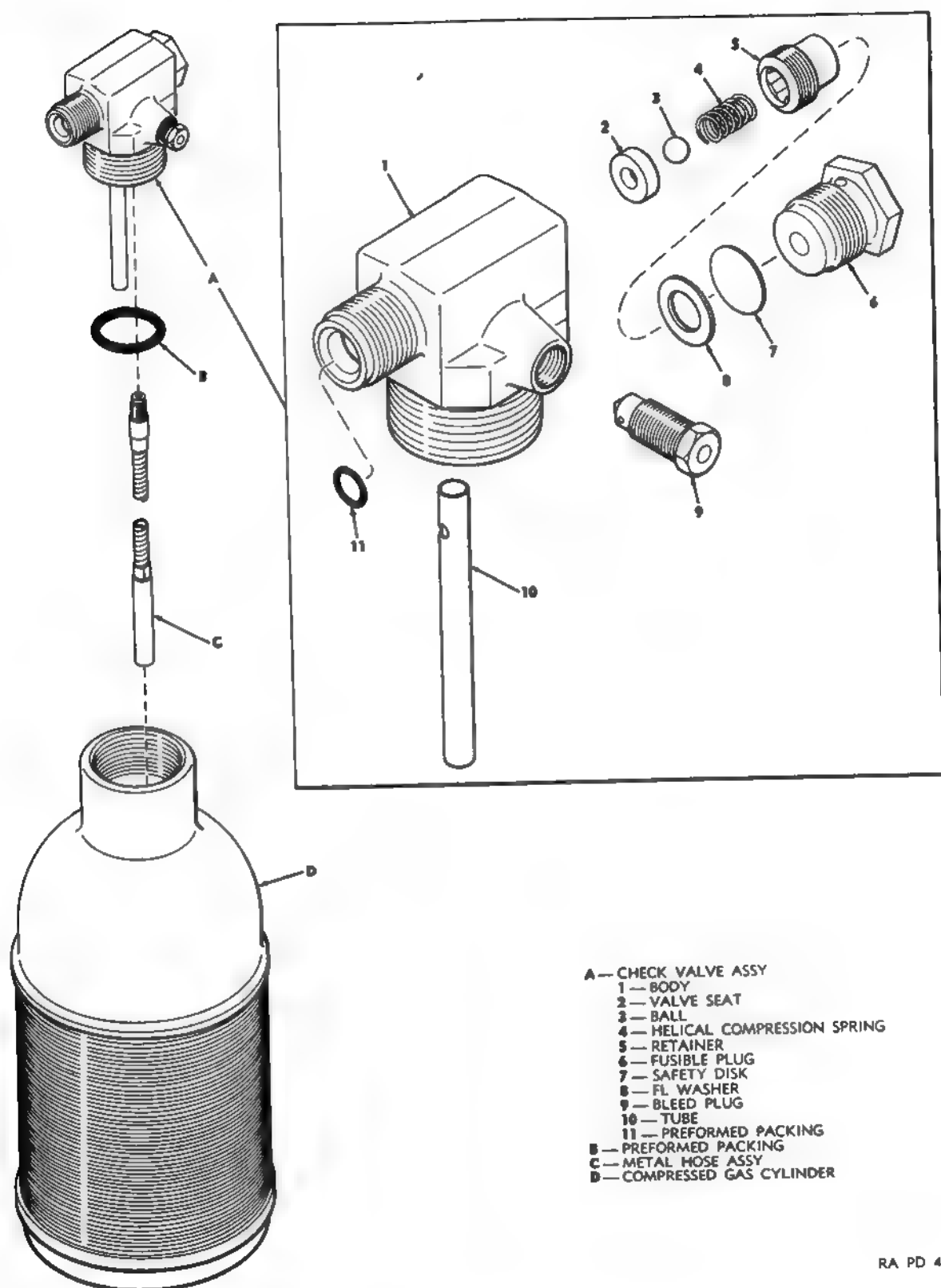
- (a) Check all connections for air leakage; if there are any leaks, remove

the attaching tube assembly (2, fig. 137) as outlined in *w* (1) below.

- (b) Check the tube end and coupling nut and the mating part which attaches to the tube assembly for damage or deformation.
- (c) Replace all defective parts and install the tube assembly as outlined in *w* (2) below.
- (d) Install the ventilatory cover assembly (fig. 123).

*k. Missile Hydraulic Pressure Fluid Filter and Pressure Reducer Valve Group.*(1) *Removal.*

- (a) Raise the erecting beam to the up-and-locked position as outlined in paragraph 44.
- (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (c) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (d) Remove the ventilatory cover assembly (fig. 123) and the access cover assembly.



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Figure 139. Compressed gas cylinder assembly — disassembly and assembly.

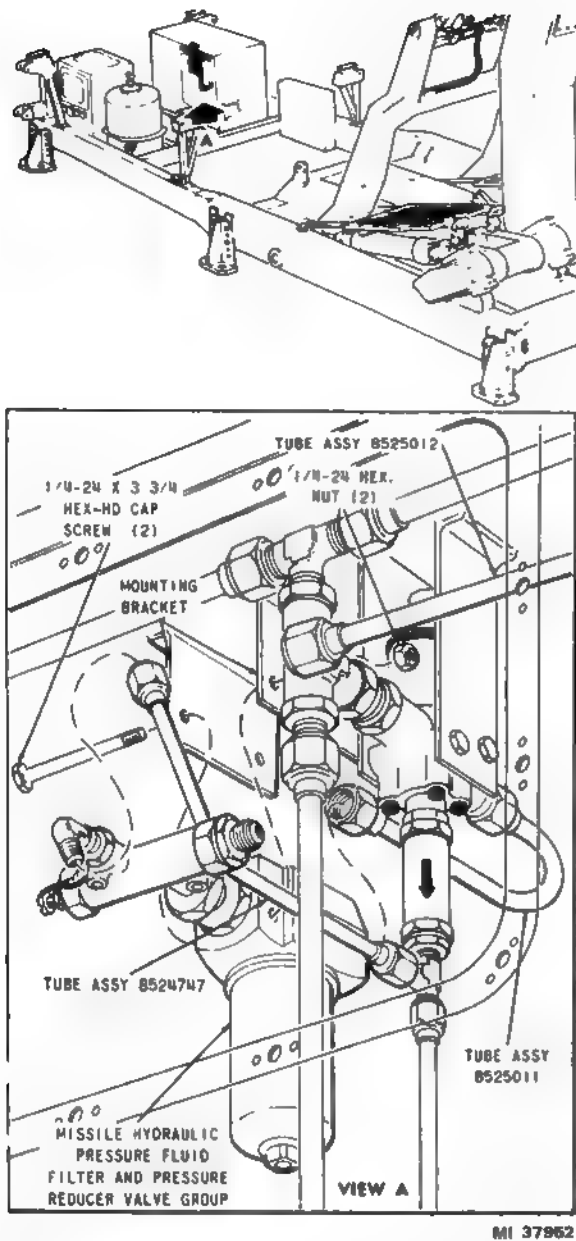


Figure 140. Missile hydraulic pressure fluid filter and pressure reducer valve group—removal and installation.

- (e) Disconnect and cap the three attaching tube assemblies (fig. 140).
- (f) Remove the missile hydraulic pressure fluid filter and pressure reducer valve group.

(2) *Disassembly.*

- (a) Disassemble the fluid filter and pressure reducer valve group (fig. 141).

- (b) Disassemble the pressure reducer valve assembly.
- (c) Disassemble the pressure fluid filter assembly (fig. 142).

(3) *Assembly.*

- (a) Assemble the pressure fluid filter assembly.
- (b) Assemble the pressure reducer valve assembly.
- (c) Assemble the missile hydraulic pressure fluid filter and pressure reducer valve group.

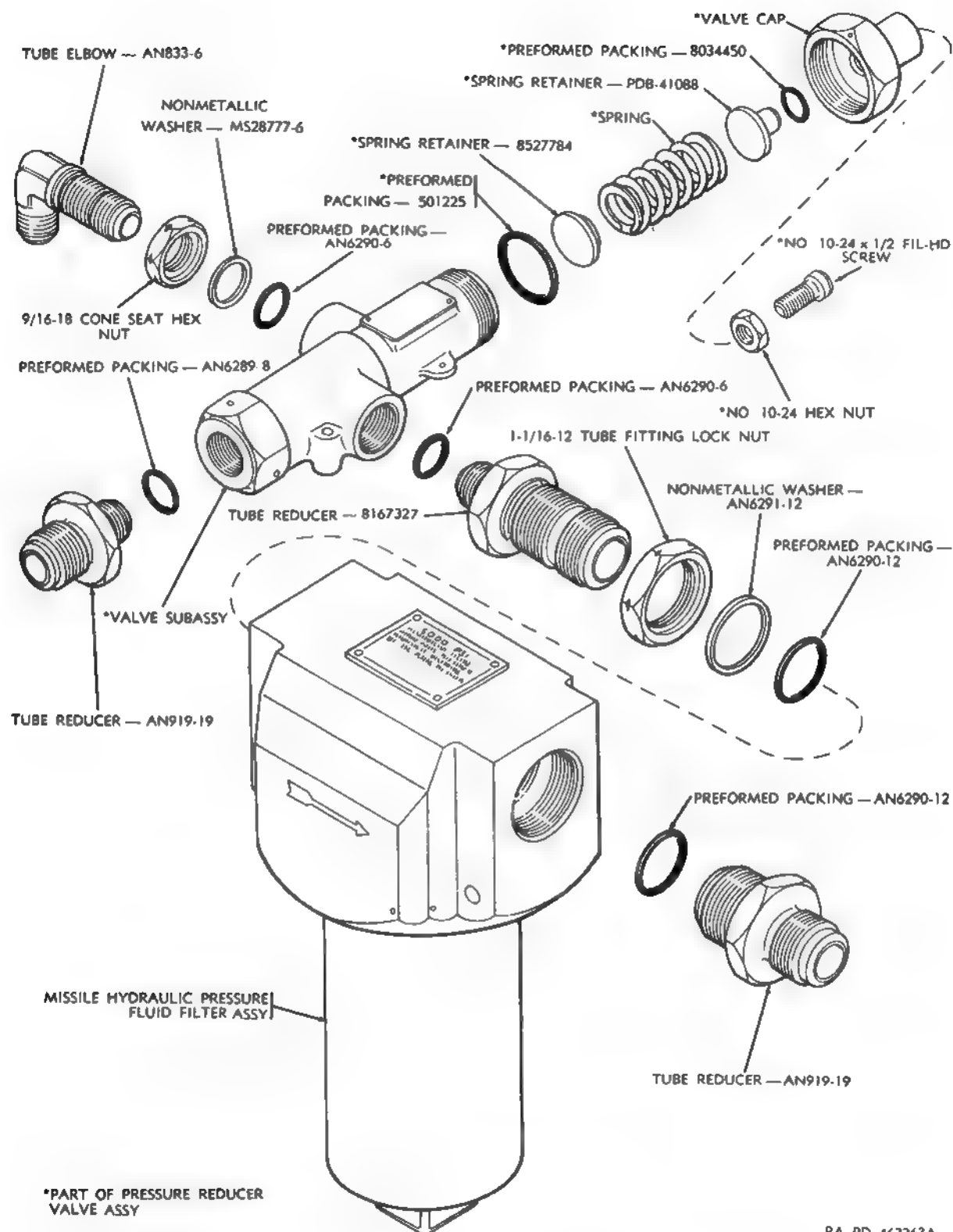
*Note.* To avoid damage to the filter element (fig. 142) when the filter assembly is installed, make certain the flow indicating arrow points away from the valve subassembly (fig. 141).

(4) *Installation.*

- (a) Install the fluid filter and pressure reducer valve group between the mounting brackets.
- (b) Connect the three attaching tube assemblies. Torque the coupling nuts of tube assemblies 8525011 and 8525012 to 500 pound-inches, and the coupling nut of tube assembly 8524747 to 300 pound-inches.
- (c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

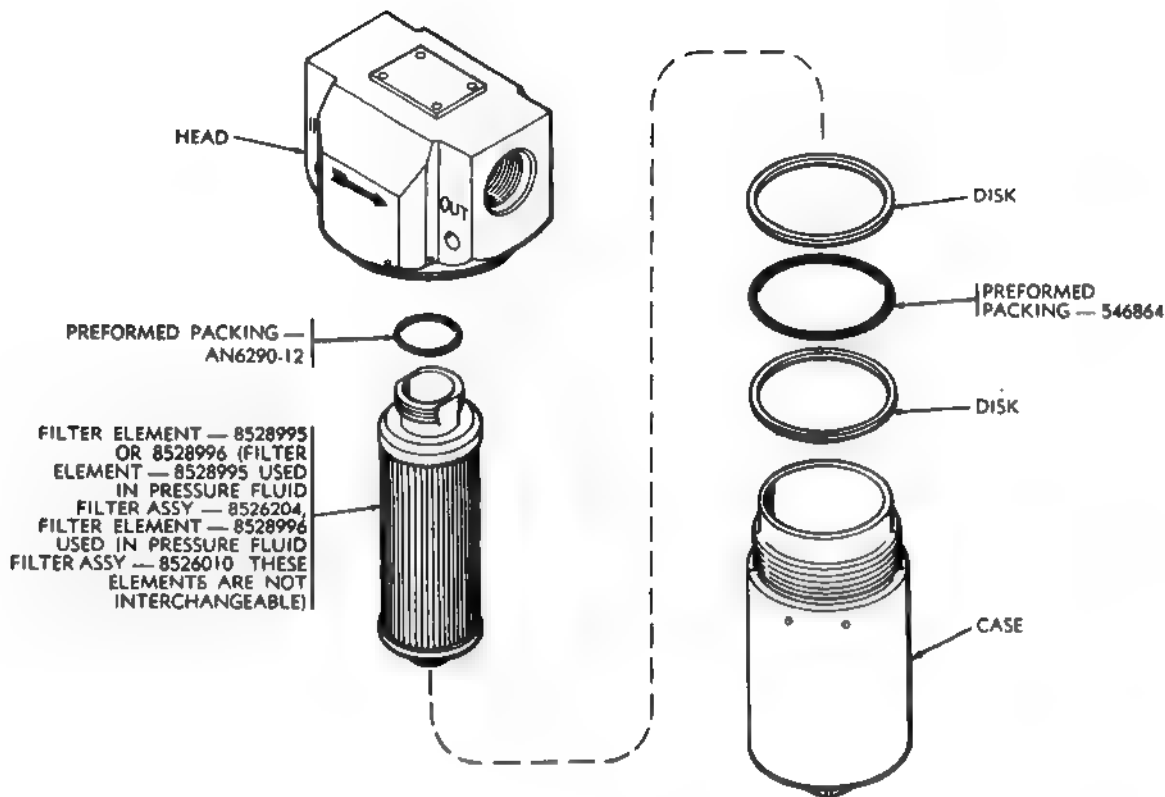
(5) *Inspection and test.*

- (a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove the attaching tube assembly (fig. 140) as described in w(1) below.
- (b) Check the tube end, the coupling nut, and the mating part which attach to the tube assembly for damage or deformation.



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Figure 141. Missile hydraulic-pressure fluid filter and pressure-reducer-valve group—disassembly and assembly.



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Figure 142. Pressure fluid filter assembly—disassembly and assembly—typical.

- (c) Replace all defective parts and install tube assembly as described in w(2) below.
- (d) Install ventilatory cover assembly and access cover assembly (fig. 123).
- (e) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.

#### l. Hydraulic Surge Accumulator and Launcher Pressure Fluid Filter Group.

##### (1) Removal.

- (a) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.
- (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (c) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (d) Depressurize the hydraulic surge accumulator as described in paragraph 41d.
- (e) Remove hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.
- (f) Disconnect the tube assemblies (fig. 143) attached to the hydraulic surge accumulator and launcher pressure fluid filter group.
- (g) Remove retaining straps, and remove accumulator and fluid filter group; cap all open hydraulic lines.

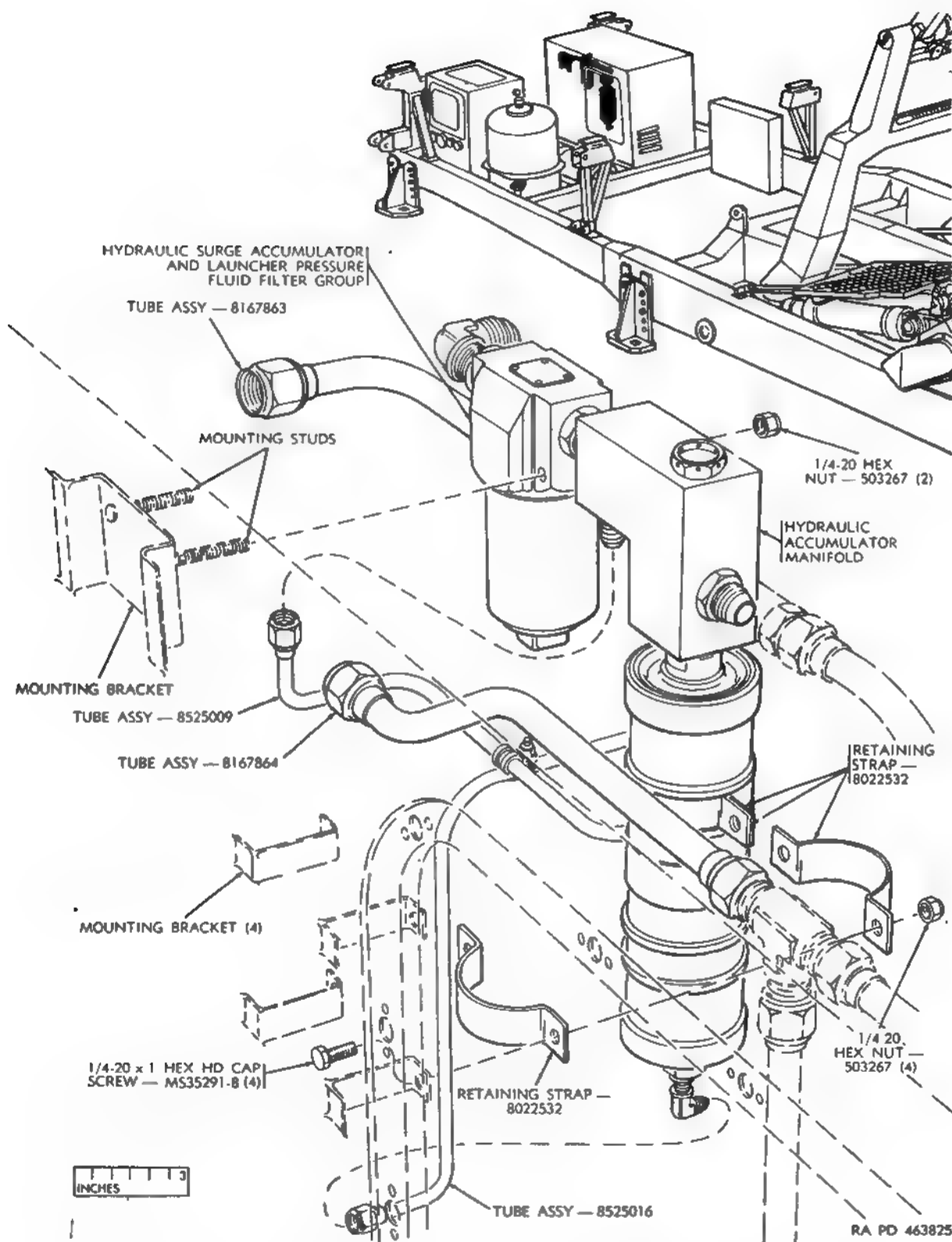


Figure 143. Hydraulic surge accumulator and launcher pressure fluid filter group — removal and installation.

(2) *Disassembly.*

- (a) Disassemble accumulator and fluid filter group (fig. 144).
- (b) Remove the two externally threaded rings (fig. 145) on hydraulic surge accumulator assembly.
- (c) Disassemble surge accumulator assembly.
- (d) Disassemble pressure fluid filter assembly (fig. 142).

(3) *Assembly.*

- (a) Install three preformed packings (fig. 145) on piston subassembly and install piston subassembly in hydraulic accumulator cylinder.
- (b) Assemble preformed packing on shell end cap - 8526381 and install end cap to face the curved side of piston subassembly.
- (c) Assemble backup ring and preformed packing on shell end cap - 8526382 and install end cap to face the flat side of piston subassembly.
- (d) Install the two externally threaded rings.
- (e) Assemble the hydraulic surge accumulator and launcher pressure fluid filter group (fig. 144).

(4) *Installation.*

- (a) Install retaining straps (fig. 143) and accumulator and launcher pressure fluid filter group.
- (b) Connect four attaching tube assemblies and torque coupling nuts to values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167863	1000
8167864	1000
8525016	150
8525009	300

- (c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

- (e) Precharge the hydraulic surge accumulator as described in paragraph 40.

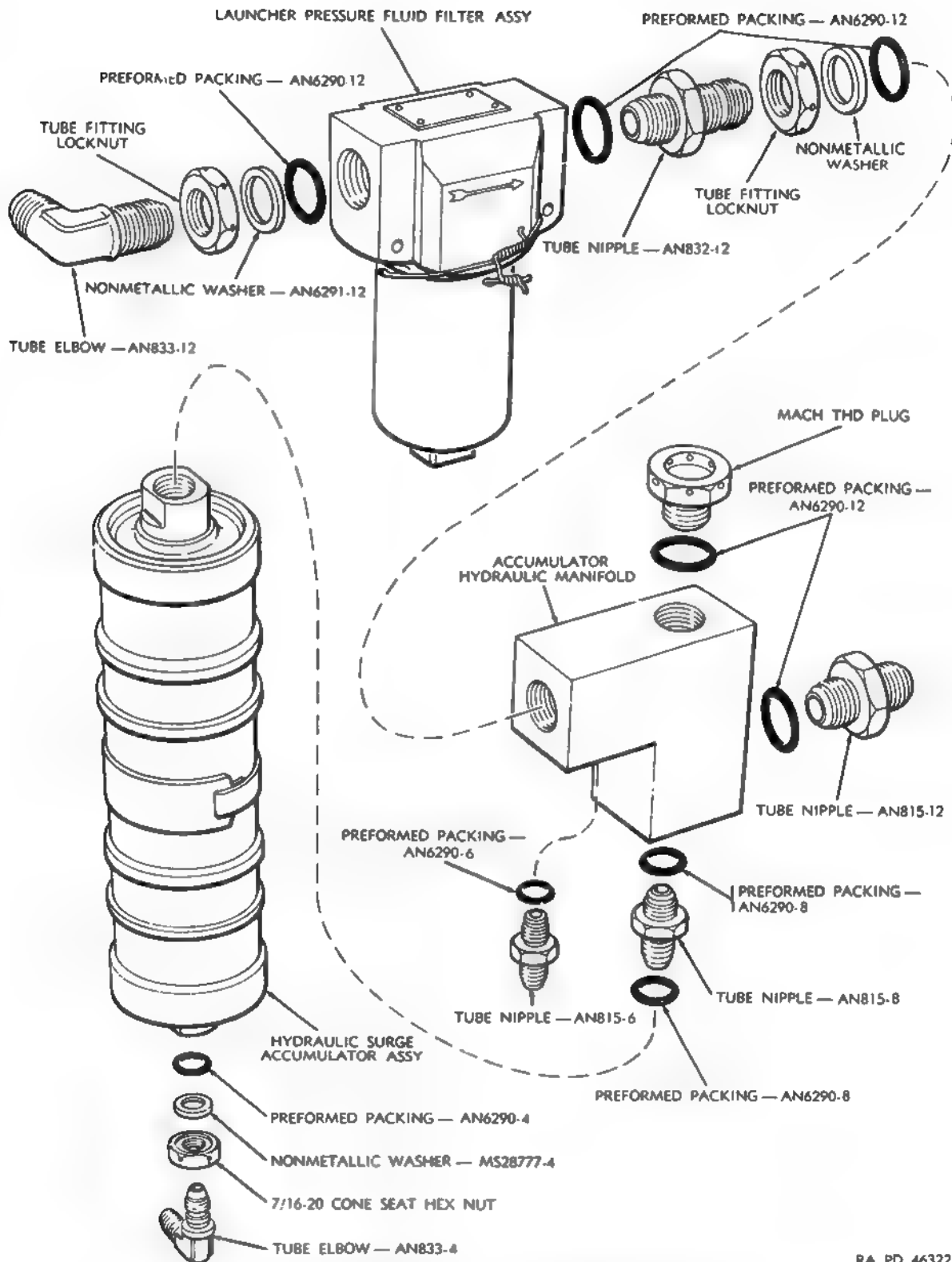
(5) *Inspection and test.*

- (a) Check all connections for fluid and air leakage; if there are any leaks, remove attaching tube assembly (fig. 144) as described in w(1) below.
- (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
- (c) Replace all defective parts and install tube assembly as described in w(2) below.
- (d) Install hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.
- (e) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

*m. SYSTEM BY-PASS Valve Group.*

(1) *Removal.*

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (c) Remove hydraulic unit door assembly (fig. 123) and the ventilatory cover assembly.
- (d) Disconnect two tube assemblies (fig. 146) attached to valve group.
- (e) Remove two hexagon nuts, handle, packing nut and lockwasher from valve group.



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*Figure 144. Hydraulic surge accumulator and launcher pressure-fluid-filter group—disassembly and assembly.*

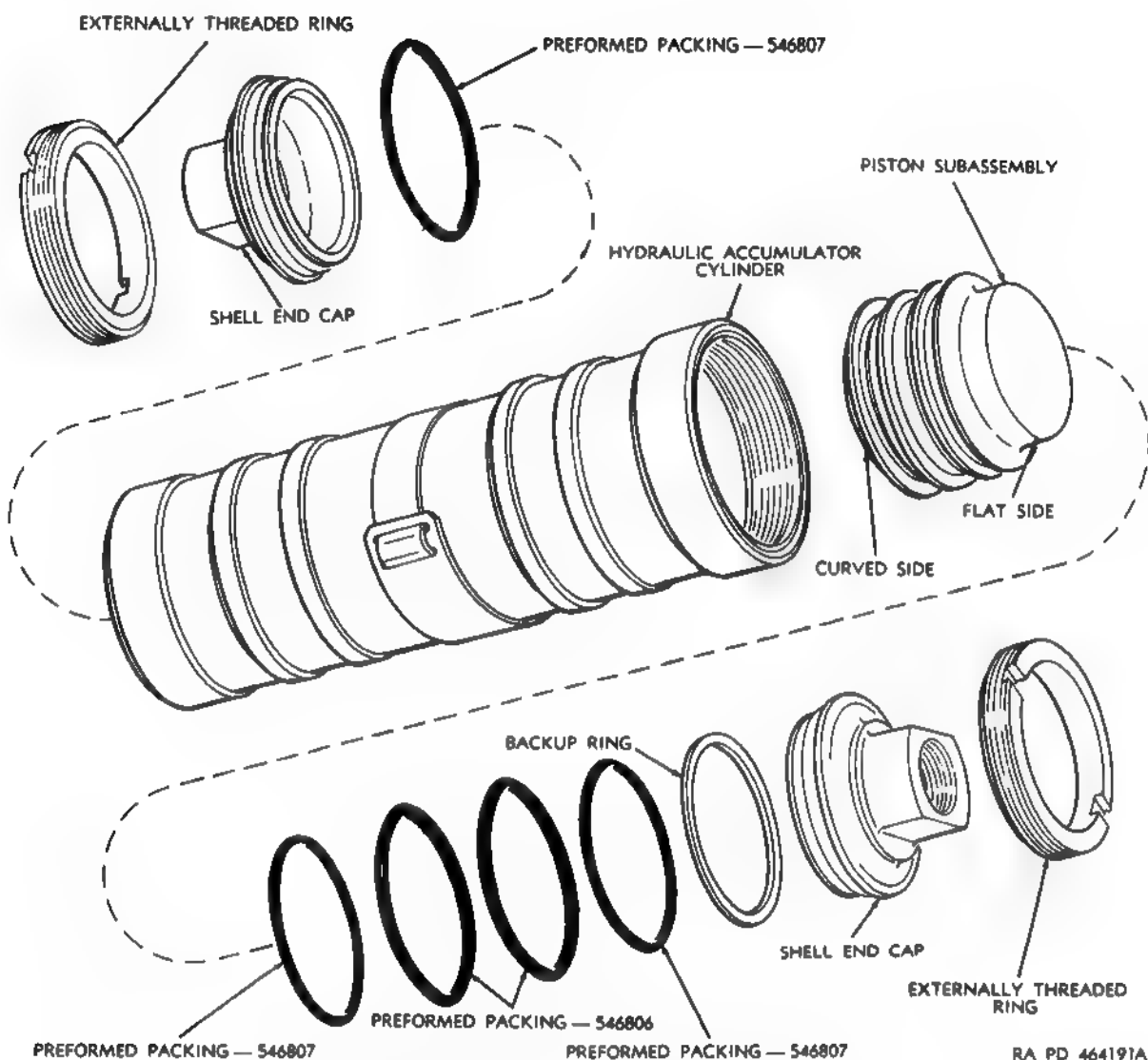


Figure 145. Hydraulic surge accumulator assembly—disassembly and assembly.

- (f) Remove valve group and cap two open hydraulic lines.
- (2) *Disassembly.*
- (a) Disassemble valve group.
  - (b) Disassemble globe valve assembly (fig. 147).
- (3) *Assembly.*
- (a) Assemble globe valve assembly.
  - (b) Assemble SYSTEM BY-PASS valve group (fig. 146).
- (4) *Installation.*
- (a) Position valve group between coupling nuts of tube assemblies and pull threaded stem of the valve group through hole in panel of hydraulic pumping unit assembly.
  - (b) Connect two attaching tube assemblies and torque coupling nuts to 300 pound-inches.
  - (c) Install lockwasher, hexagon nut, handle, and hexagon nut.
  - (d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

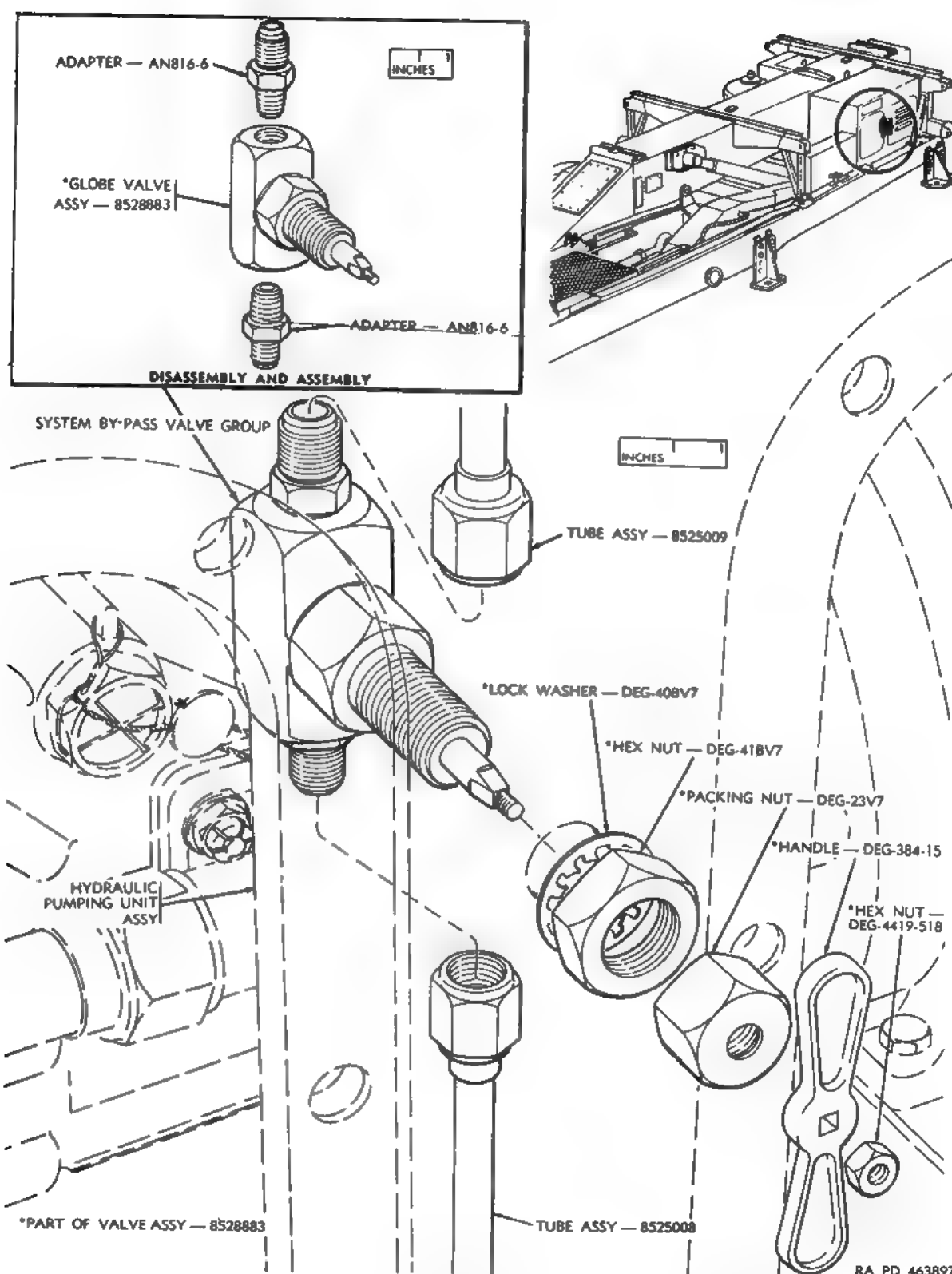


Figure 146. SYSTEM BY-PASS valve group — removal and installation.

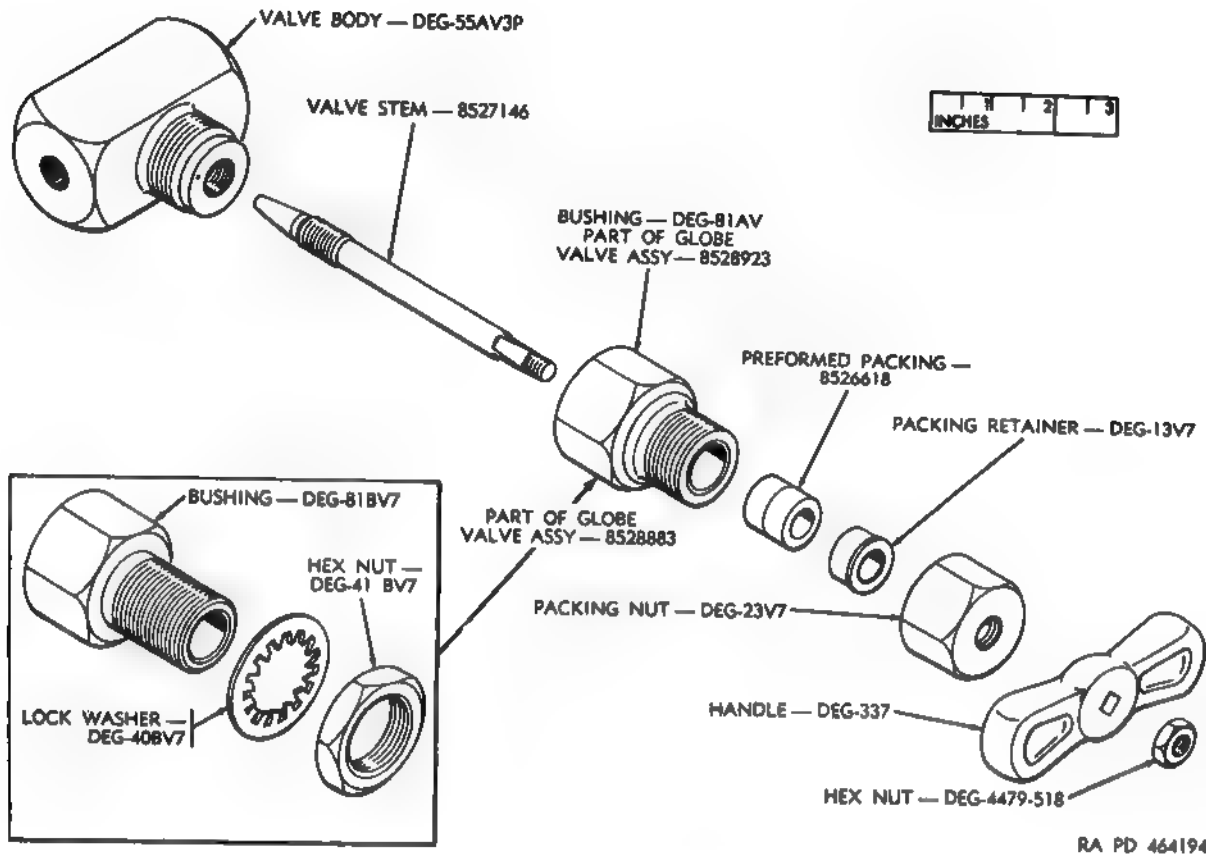


Figure 147. Globe valve assembly — disassembly and assembly — typical.

- (e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (f) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.
- (5) *Inspection and test.*
  - (a) Check the hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 146) as described in *w*(1) below.
  - (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage of deformation.
  - (c) Replace all defective parts and install tube assembly as described in *w*(2) below.

- (d) Install hydraulic unit door assembly (fig. 123) and ventilatory cover assembly.

#### n. Dial Indicating Pressure Gage Group (HYDRAULIC RESERVOIR PRESSURE).

##### (1) *Removal.*

- (a) Depressurize the hydraulic oil reservoir (fig. 60) by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (b) Remove hydraulic unit door assembly (fig. 123) and open door group (fig. 148).
- (c) Disconnect the tube assembly.
- (d) Remove dial indicating pressure gage group and cap tube assembly.

(2) *Disassembly.* Disassemble the gage group.

(3) *Assembly.* Assemble the gage group.

(4) *Installation.*

(a) Install the gage group and torque the coupling nut of the tube assembly to 150 pound-inches.

(b) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) *Inspection and test.*

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove the attaching tube assembly as described in *w*(1) below.

(b) Check the tube end, the coupling nut, and the mating part which attach to the tube assembly for damage or deformation.

(c) Replace all defective parts and install the tube assembly as described in *w*(2) below.

(d) Install the hydraulic unit door assembly (fig. 123) and close the door group (fig. 148).

*o. Dial Indicating Pressure Gage Group (EQUILIBRATOR ACCUMULATOR PRESSURE).*

(1) *Removal.*

(a) Depressurize the equilibrator accumulator as described in paragraph 41d.

(b) Remove the hydraulic unit door assembly (fig. 123) and open the door group (fig. 148).

(c) Disconnect the tube assembly.

(d) Remove the gage group and cap the tube assembly.

(2) *Disassembly.* Disassemble the gage group.

(3) *Assembly.* Assemble the gage group.

(4) *Installation.*

(a) Install the gage group and torque the coupling nut of the tube assembly to 150 pound-inches.

(b) Precharge the equilibrator accumulator assembly as described in paragraph 40.

(5) *Inspection and test.*

(a) Check all connections for air leakage; if there are any leaks, remove the attaching tube assembly as described in *w*(1) below.

(b) Check the tube end, the coupling nut, and the mating part which attach to the tube assembly for damage or deformation.

(c) Replace all defective parts and install the tube assembly as described in *w*(2) below.

(d) Install the hydraulic unit door assembly (fig. 123) and close the door group (fig. 148).

*p. Dial Indicating Pressure Gage Group (SURGE ACCUMULATOR PRESSURE).*

(1) *Removal.*

(a) Depressurize the hydraulic surge accumulator as described in paragraph 41d.

(b) Remove the hydraulic unit door assembly (fig. 123) and open the door group (fig. 148).

(c) Disconnect the tube assembly.

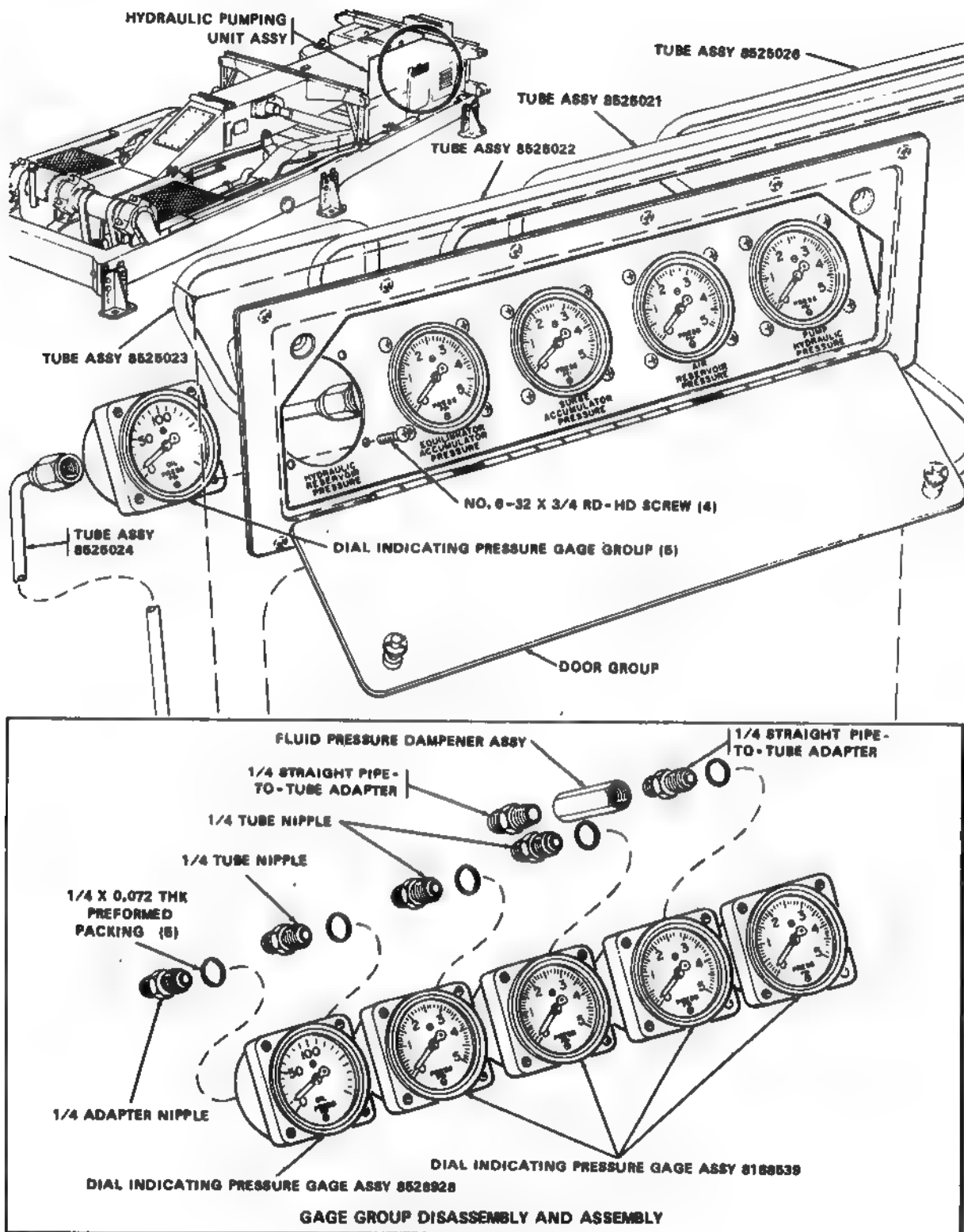
(d) Remove the gage group and cap the tube assembly.

(2) *Disassembly.* Disassemble the gage group.

(3) *Assembly.* Assemble the gage group.

(4) *Installation.*

(a) Install the gage group and torque the coupling nut of the tube assembly to 150 pound-inches.



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Figure 148. Dial indicating pressure gage group — removal and installation — typical.

- (b) Precharge the hydraulic surge accumulator as described in paragraph 40.

(5) *Inspection and test.*

- (a) Check all connections for air leakage; if there are any leaks, remove attaching tube assembly as described in *w*(1) below.
- (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
- (c) Replace all defective parts and install tube assembly as described in *w*(2) below.
- (d) Install hydraulic unit door assembly (fig. 123) and close door group (fig. 148).

*q. Dial Indicating Pressure Gage Group (AIR RESERVOIR PRESSURE).*

(1) *Removal.*

- (a) Depressurize the compressed gas cylinder as described in paragraph 41d.
- (b) Remove hydraulic unit door assembly (fig. 123) and open door group (fig. 148).
- (c) Disconnect the tube assembly.
- (d) Remove dial indicating pressure gage group and cap tube assembly.
- (2) *Disassembly.* Disassemble gage group.
- (3) *Assembly.* Assemble dial indicating pressure gage group.
- (4) *Installation.*
  - (a) Install gage group and torque coupling nut of tube assembly to 150 pound-inches.
  - (b) Precharge the compressed gas cylinder as described in paragraph 40.
- (5) *Inspection and test.*
  - (a) Check all connections for air leakage; if there are any leaks, re-

move attaching tube assembly as described in *w*(1) below.

- (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
- (c) Replace all defective parts and install tube assembly as described in *w*(2) below.
- (d) Install hydraulic unit door assembly (fig. 123) and close door group (fig. 148).

*r. Dial Indicating Pressure Gage Group (PUMP HYDRAULIC PRESSURE).*

(1) *Removal.*

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (c) Remove hydraulic unit door assembly (fig. 123) and open door group (fig. 148).
- (d) Disconnect the tube assembly.
- (e) Remove dial indicating pressure gage group and cap tube assembly.
- (2) *Disassembly.* Disassemble gage group.
- (3) *Assembly.* Assemble dial indicating pressure gage group.
- (4) *Installation.*
  - (a) Install gage group and torque coupling nut of tube assembly to 150 pound-inches.
  - (b) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
  - (c) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

**(5) Inspection and test.**

- (a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly, as described in *w(1)* below.
- (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
- (c) Replace all defective parts and install tube assembly as described in *w(2)* below.
- (d) Install hydraulic unit door assembly (fig. 123) and close door group (fig. 148).

**s. Pneumatic Tank Valve Assembly (AIR RESERVOIR AIR FILLER 2000 PSI MAX.) and Air Filler Manifold Group.**

**(1) Removal.**

- (a) Depressurize the compressed gas cylinder as described in paragraph 41d.
- (b) Remove ventilatory cover assembly (fig. 123).
- (c) Disconnect two tube assemblies (fig. 149).
- (d) Remove pneumatic tank valve assembly.
- (e) Remove air filler manifold group by removing four fillister-head screws and flat washers.
- (f) Remove rubber and cork gasket and identification plate; cap two tube assemblies.

**(2) Disassembly.** Disassemble air filler manifold group.**(3) Assembly.** Assemble air filler manifold group.**(4) Installation.**

- (a) Position rubber and cork gasket between manifold group and panel of hydraulic pumping unit assembly.

- (b) Position identification plate on outside of pumping unit assembly.

- (c) Install manifold group, gasket, and plate, and safety four No. 10-32 x  $\frac{1}{16}$  fillister-head screws with 0.032-inch steel lockwire.

- (d) Connect tube assemblies and torque coupling nuts to 150-pound-inches.

- (e) Precharge the compressed gas cylinder as described in paragraph 40.

**(5) Inspection and test.**

- (a) Check all connections for air leakage; if there are any leaks, remove attaching tube assembly as described in *w(1)* below.

- (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

- (c) Replace all defective parts and install tube assembly as described in *w(2)* below.

- (d) Install ventilatory cover assembly (fig. 123).

**t. Pneumatic Tank Valve Assembly (SURGE ACCUMULATOR AIR FILLER 2000 PSI MAX.) and Air Filler Manifold Group.**

**(1) Removal.**

- (a) Depressurize the hydraulic surge accumulator as described in 41d.

- (b) Remove ventilatory cover assembly (fig. 123).

- (c) Disconnect two tube assemblies (fig. 149).

- (d) Remove pneumatic tank valve assembly.

- (e) Remove air filler manifold group by removing four fillister-head screws and flat washers.

- (f) Remove rubber and cork gasket and identification plate; cap two tube assemblies.

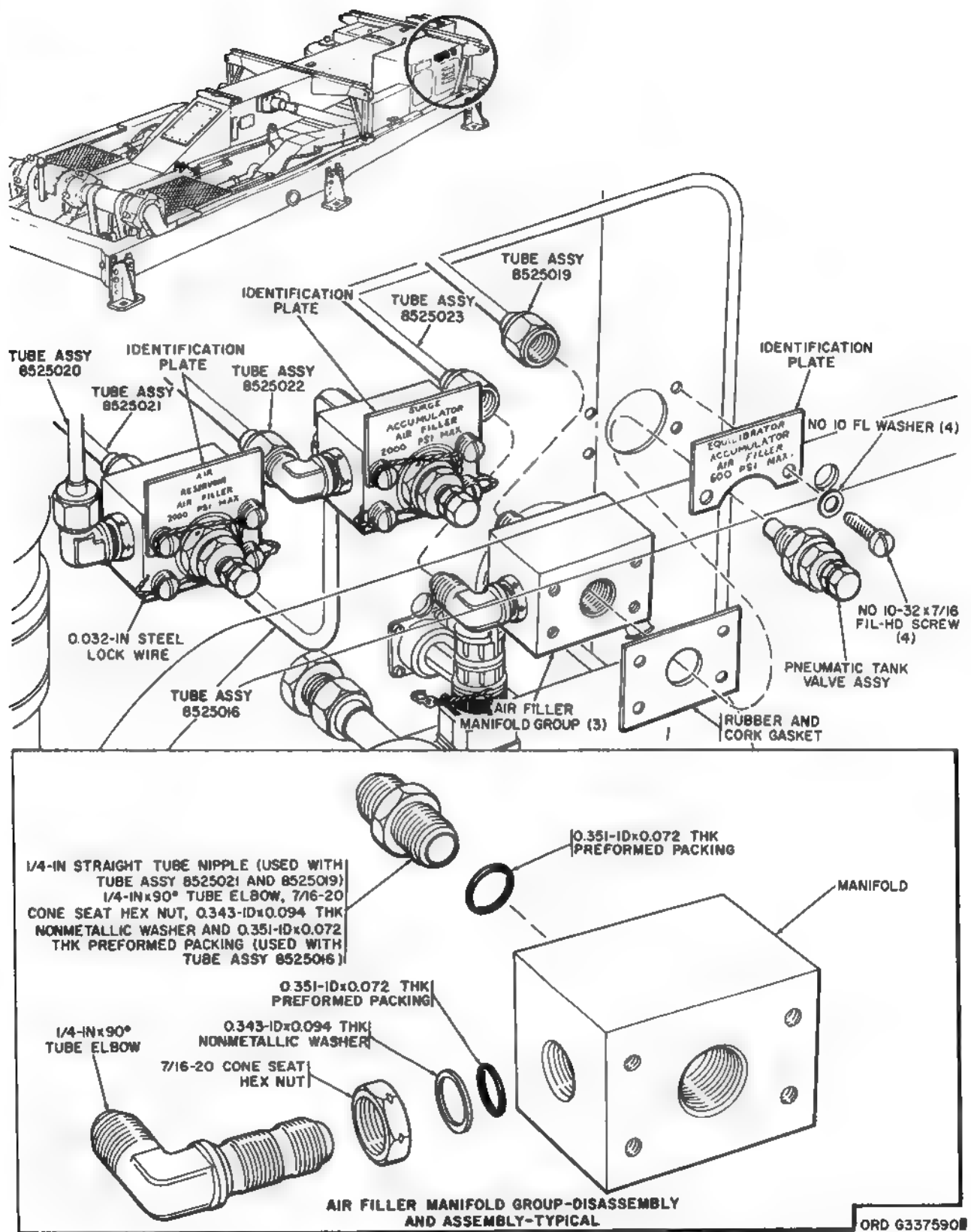


Figure 149. Pneumatic tank valve assembly and air filler manifold group – removal and installation – typical.

- (2) *Disassembly.* Disassemble the air filler manifold group.
- (3) *Assembly.* Assemble the air filler manifold group.
- (4) *Installation.*
  - (a) Position the rubber and cork gasket between the manifold group and the panel of the hydraulic pumping unit assembly.
  - (b) Position the identification plate on the outside of the hydraulic pumping unit assembly.
  - (c) Secure the manifold group, gasket, and plate to the panel with four No. 10-32 x  $\frac{7}{16}$  fillister-head screws; secure the screws with 0.032-inch steel lockwire.
  - (d) Connect the tube assemblies and torque the coupling nuts to 150 pound-inches.
  - (e) Precharge the hydraulic surge accumulator as outlined in paragraph 40.
- (5) *Inspection and test.*
  - (a) Check all connections for air leakage; if there are any leaks, remove the attaching tube assembly as outlined in *w*(1) below.
  - (b) Check the tube end and coupling nut and the mating part which attaches to the tube assembly for damage or deformation.
  - (c) Replace all defective parts and install the tube assembly as outlined in *w*(2) below.
  - (d) Install the ventilatory cover assembly (fig. 123).

*u. Pneumatic Tank Valve Assembly (EQUILIBRATOR ACCUMULATOR AIR FILLER 600 PSI MAX.) and Air Filler Manifold Group.*

- (1) *Removal.*
  - (a) Depressurize the equilibrator accumulator as outlined in paragraph 41d.
  - (b) Remove the ventilatory cover assembly (fig. 123).
  - (c) Disconnect the two tube assemblies (fig. 149).

- (d) Remove the pneumatic tank valve assembly.
- (e) Remove the air filler manifold group by removing four fillister-head screws and flat washers.
- (f) Remove the rubber and cork gasket and identification plate; cap the two tube assemblies.
- (2) *Disassembly.* Disassemble the air filler manifold group.
- (3) *Assembly.* Assemble the air filler manifold group.
- (4) *Installation.*
  - (a) Position the rubber and cork gasket between the manifold group and the panel of the hydraulic pumping unit assembly.
  - (b) Position the identification plate on the outside of the hydraulic pumping unit assembly.
  - (c) Secure the manifold group, gasket, and plate to the panel with four No. 10-32 x  $\frac{7}{16}$  fillister-head screws; secure the screws with 0.032-inch steel lockwire.
  - (d) Connect the tube assemblies and torque the coupling nuts to 150 pound-inches.
  - (e) Precharge the equilibrator accumulator as outlined in paragraph 40.
- (5) *Inspection and test.*
  - (a) Check all connections for air leakage; if there are any leaks, remove the attaching tube assembly as outlined in *w*(1) below.
  - (b) Check the tube end and coupling nut and the mating part which attaches to the tube assembly for damage or deformation.
  - (c) Replace all defective parts and install the tube assembly as outlined in *w*(2) below.
  - (d) Install the ventilatory cover assembly (fig. 123).

*v. External Tube Fittings.* A typical removal and installation of an external tube fitting at-

tached to the hydraulic pumping unit (fig. 3) is described in (1) through (3) below:

(1) *Removal.*

- (a) Raise the erecting beam to the up-and-locked position, if necessary, to provide ease of maintenance, as described in TM 9-1440-250-20/1.

- (b) Perform the depressurization required before removal of fitting as described in table XI.

*Note.* Orientation in table XI with respect to "left," "right," or "rear" of the hydraulic pumping unit is always when standing at the rear of the Hercules monorail launcher, facing forward.

*Table XI. Hydraulic Pumping Unit Assembly External Tube Fittings*

Fitting	Depressurization required before removal of fitting	Pressurization required after installation of fitting
Tube tee - AN804-6 (fig. 150)	Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.	Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
Tube elbow - AN833-6 (two tube elbows, fig. 150)	Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.	Pressurize the launcher hydraulic reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
Tube elbow - AN833-12 (on right side of pumping unit, fig. 150)		
Tube elbow - AN833-12 (on left side of pumping unit, fig. 151)		
Tube elbow - AN833-16 (fig. 151)		
Tube elbow - AN833-8 (fig. 150)	Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.	Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
Tube elbow - AN833-12 (on rear side of pumping unit, fig. 150)		
Nipple - AN832-4 (fig. 151)	Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.  Depressurize the equilibrator accumulator as described in paragraph 41d.	Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.  Precharge the equilibrator accumulator as described in paragraph 40.
Tube elbow - AN833-4 (fig. 150).	Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.  Depressurize the compressed gas cylinder as described in paragraph 41d.	Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.  Precharge the compressed gas cylinder as described in paragraph 40.

- (c) Remove the required hydraulic pumping unit assembly access covers (fig. 123).

- (d) Disconnect internal and external tube assemblies from tube fitting to be removed (figs. 150 and 151).

- (e) Remove tube fitting and cap open lines.

(2) *Installation.*

- (a) Install tube fitting.

*Note.* When installing any tube fitting having a flat washer, place washer against shoulder of tube fitting and install hexagon nut or locknut on opposite side of mounting hole.

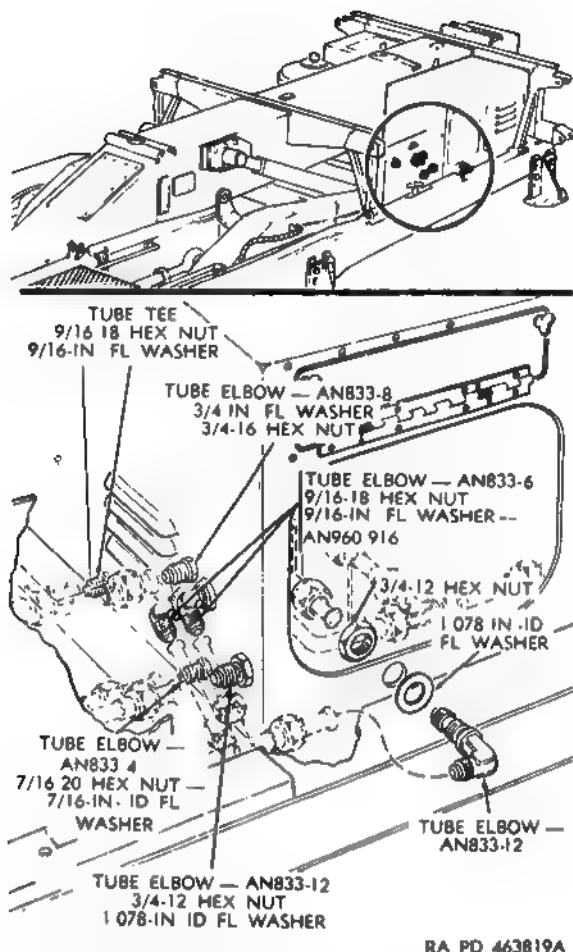


Figure 150. Hydraulic pumping unit assembly external tube fittings—removal and installation.

- (b) Connect tube assemblies and torque coupling nuts to values specified below:

Fitting	Tube Assembly torque values (pound-inches)
Tube elbow- AN833-12 (figs. 150 and 151)	1000 (6 places)
Tube elbow- AN833-4 (fig. 150)	150 (2 places)
Nipple- AN832-4 (fig. 151)	150 (2 places)
Tube elbow- AN833-6 (two tube elbows, fig. 150)	300 (2 places on each elbow)

#### Fitting

#### Tube Assembly torque values (pound-inches)

Tube elbow- AN833-8 (fig. 150)	500 (2 places)
Tube tee- AN804-6 (fig. 150)	300 (2 places)
Tube elbow- AN833-16 (fig. 151)	1450 (2 places)

- (c) Perform the pressurization required after installation of fitting as described in table XI.
- (d) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.
- (e) Perform the launcher hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.

*Note.* No air bleed procedure is necessary for the removal and installation of tube elbow - AN833-4 (fig. 150) and nipple - AN832-4 (fig. 151).

#### (3) Inspection and test.

- (a) Check the tubing connections for fluid and air leakage; if there are any leaks, perform 1 through 3 below.

1. Remove the tube assembly (figs. 152 and 153) as described in w(1) below.

2. Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

3. Replace all defective parts and install tube assembly as described in w(2) below.

- (b) Install hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access door assembly.

- (c) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.

*w. Hydraulic Pumping Unit Assembly Network.* The hydraulic pumping unit assembly network (figs. 152 and 153) consists of a net-

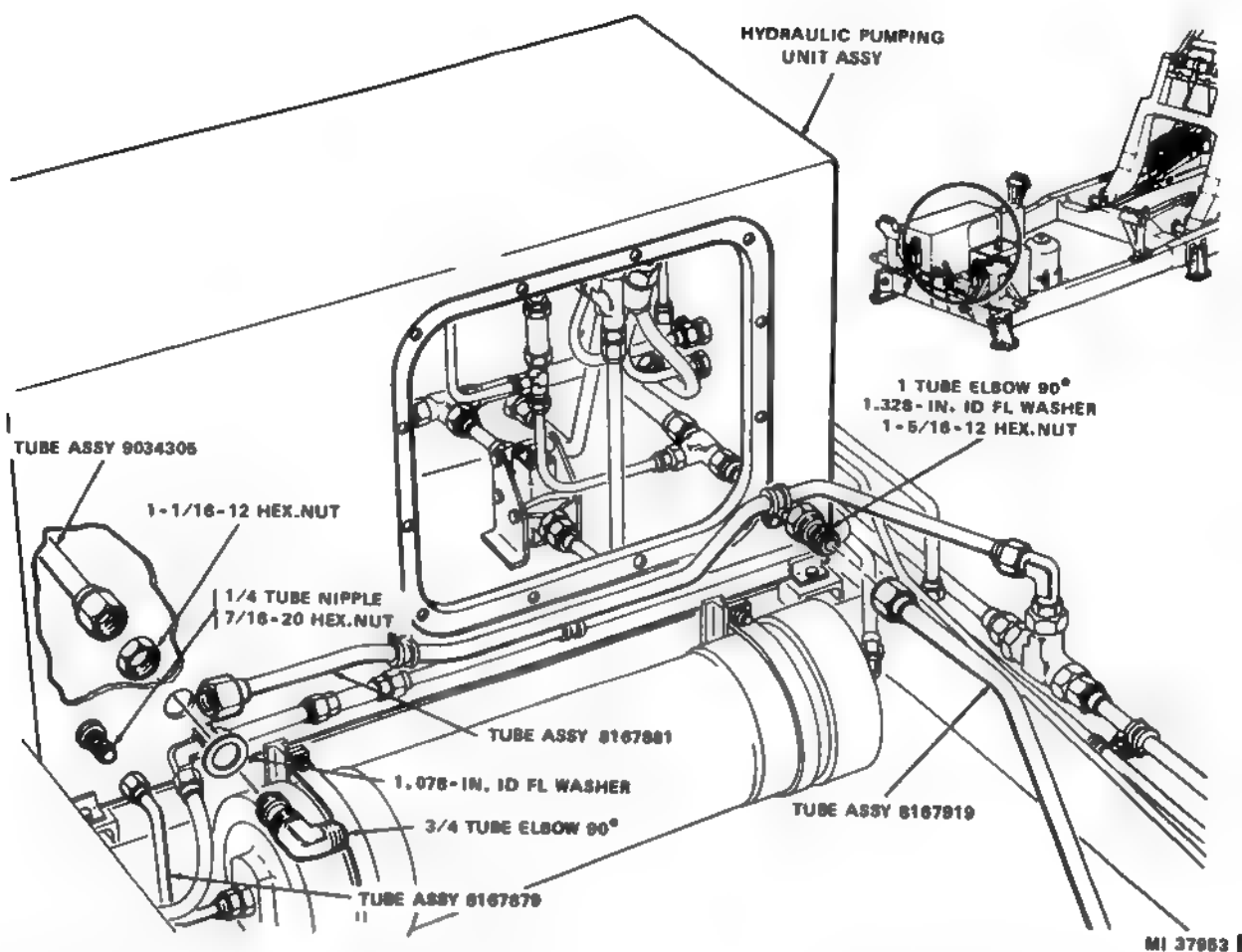


Figure 151. Hydraulic pumping unit assembly external tube fittings — removal and installation — Continued.

work of the tube assemblies and their fittings, required to provide system interconnection between the components inside the pumping unit assembly. Typical removal and installation procedures for a tube assembly or fitting of the network are provided in (1) and (2) below.

(1) Removal.

- (a) Raise the erecting beam to the up-and-locked position, if necessary, to

provide ease of maintenance, as described in TM 9-1440-250-20/1.

- (b) Remove the hydraulic unit door assembly (fig. 123) and the ventilatory cover assembly.
- (c) Perform the depressurization required before the removal of the component as described in table XII.

Table XII. Hydraulic pumping unit assembly network — pressurization and torque value requirements.

Component	Part No.	Torque value (pound-inches)	Fig. No.	Depressurization required before removal	Pressurization required after installation
Tube assembly	8167860	1450	152	Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.	Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
Tube assembly	8167864	1000	152		
Tube assembly	8167865	1000	152		
Tube assembly	8167866	500	152		
Tube assembly	8167869	1000	152		

*Table XII. Hydraulic Pumping Unit Assembly Network - Pressurization and Torque Value Requirements - Continued*

Component	Part No.	Torque value (pound-inches)	Fig. No.	Depressurization required before removal	Pressurization required after installation
Tube assembly	8524747	300	152	Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.	Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
Tube assembly	8525001	1000	152		
Tube assembly	8525003	1000	152		
Tube assembly	8525013	300	152		
Tube assembly	8525014	1000	152		
Tube assembly	8525015	300	152		
Tube elbow	8526151		152		
Tube tee	8526145		152		
Check valve	8170445		153		
Deloader valve assembly	9033138		153		
Tube assembly	8167861	1000	153		
Tube assembly	8167862	1000	153		
Tube assembly	8167863	1000	153		
Tube assembly	8167867	300	153		
Tube assembly	8167868	300	153		
Tube assembly	8167870	1000	153		
Tube assembly	8525000	500	153		
Tube assembly	8525002	1000	153		
Tube assembly	8525004	1000	153		
Tube assembly	8525005	1000	153		
Tube assembly	8525008	300	153		
Tube assembly	8525009	300	153		
Tube assembly	8525017	1000	153		
Tube assembly	8525024	150	153		
Tube assembly	9021688	150	153		
Tube assembly	8525243	300	153		
Tube assembly	9034303	300	153		
Tube assembly	9034304	1000	153		
Tube assembly	9034305	1000	153		
Tube tee	8525061		153		
Tube assembly	8525010	150	153	OPEN the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.	Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
Tube assembly	8525011	500	152		
Tube assembly	8525012	500	152		
Tube assembly	8525016	150	152	Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.	Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
Tube assembly	8525022	150	153		
				Depressurize the hydraulic surge accumulator as described in paragraph 41d.	Precharge the hydraulic surge accumulator as described in paragraph 40.

Table XII. Hydraulic Pumping Unit Assembly Network--Pressurization and Torque Value Requirements--Continued

Component	Part no.	Torque value (pound-inches)	Fig. no.	Depressurization required before removal	Pressurization required after installation
Tube assembly	8525019	150	152	Open the EQUI- BRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.  Depressurize the equi- brator accumulator as outlined in para- graph 41d.	Close the EQUI- BRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.  Precharge the equilibrator accumulator as outlined in paragraph 40.
Tube assembly	8525023	150	153		
Tube assembly	8525018	150	153	Open the EQUI- BRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.  Depressurize the com- pressed gas cylinder as outlined in para- graph 41d.	Close the EQUI- BRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.  Precharge the compressed gas cylinder as outlined in paragraph 40.
Tube assembly	8525020	150	153		
Tube assembly	8525021	150	153		
Tube assembly	8525025	150	153		

- (d) Remove the component to be re-  
placed and cap the open lines.

(2) *Installation.*

- (a) Install the component.
- (b) Connect the tube assemblies and torque the coupling nuts to the value specified in table XII.
- (c) Perform the pressurization required after installation of the component as specified in table XII.
- (d) Perform the launcher hydraulic system air bleed procedure as outlined in TM 9-1440-250-20/1 after the installation of all components except the following:

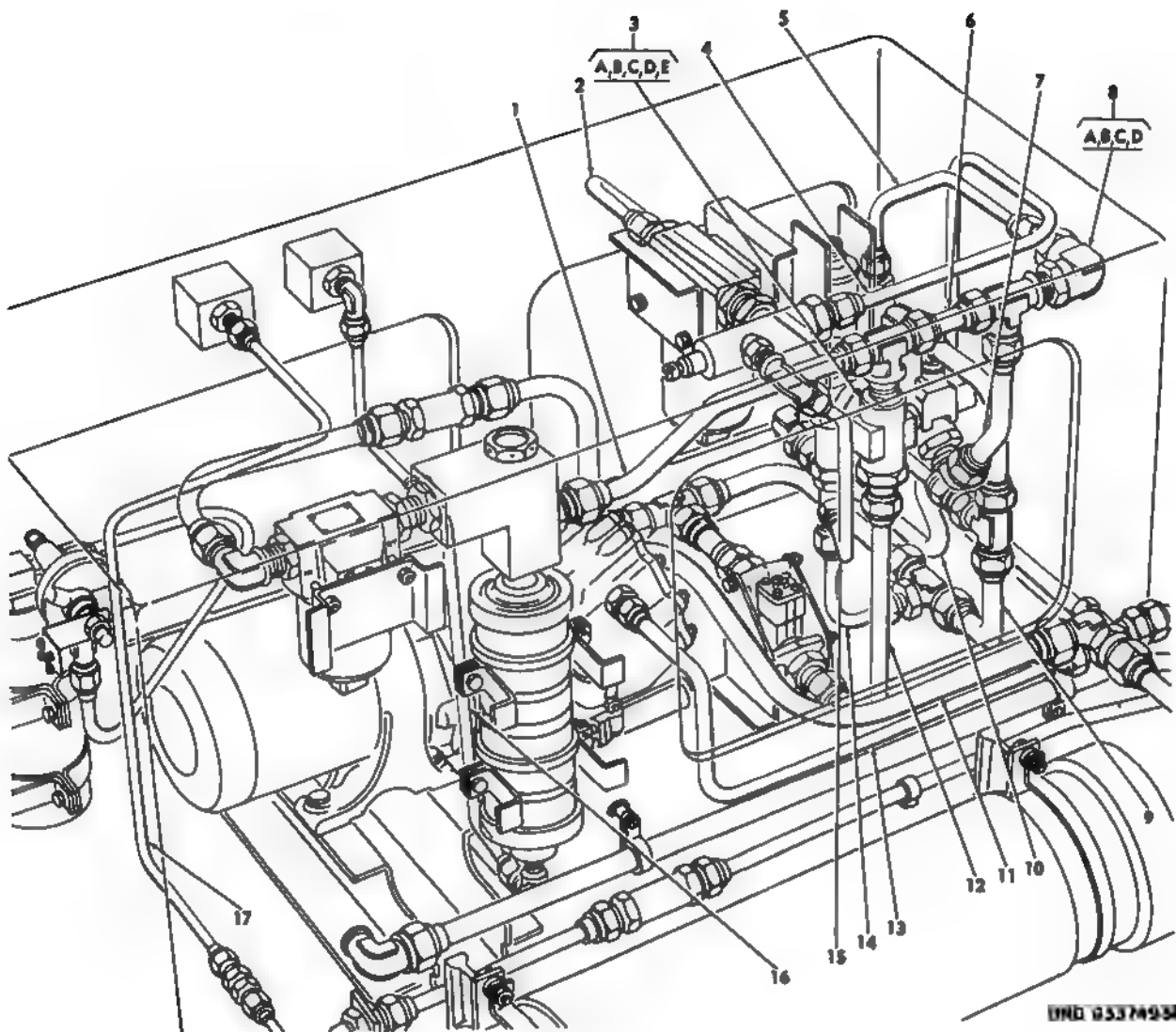
Tube assembly-8525010  
 Tube assembly-8525016  
 Tube assembly-8525018  
 Tube assembly-8525019  
 Tube assembly-8525020  
 Tube assembly-8525021  
 Tube assembly-8525022  
 Tube assembly-8525023  
 Tube assembly-8525025

(3) *Inspection and test.*

- (a) Check the tubing connections for fluid and air leakage; if there are any leaks, perform steps 1 through 3 below.
1. Remove the tube assembly (figs. 152 and 153) as outlined in (1) above.
  2. Check the tube end and coupling nut and the mating part which attaches to the tube assembly for damage or deformation.
  3. Replace all defective parts and install the tube assembly as outlined in (2) above.
- (b) Install the hydraulic unit door assembly (fig. 123), the ventilatory cover assembly, and the access door assembly.
- (c) Lower the launcher erecting beam to the down-and-locked position.

### 81. Hydraulic Panel

The hydraulic panel (fig. 3) is located on the



- 1-Tube assy 8167864
- 2-Tube assy 8525011
- 3-Tube tee group
  - A- $1\frac{1}{16}$ -12 univ tube nut (2)
  - B- $\frac{3}{4}$ -in. tube tee
  - C-0.922 id x 0.125 thk pkg ret. (2)
  - D- $\frac{3}{4}$ -in. tube union
  - E-0.924 id x 0.116 thk preformed pkg (3)
- 4-Tube assy 8525012
- 5-Tube assy 8167866
- 6-Tube assy 8167865
- 7-Tube assy 8525001
- 8-Elbow group

- A- $1\frac{1}{16}$ -12 univ tube nut
- B- $\frac{3}{4}$  od x 90° elbow
- C-0.924 id x 0.116 thk preformed pkg (2)
- D- $\frac{3}{4}$  x  $\frac{1}{2}$  tube reducer
- 9-Tube assy 8525003
- 10-Tube assy 8167869
- 11-Tube assy 8167860
- 12-Tube assy 8525014
- 13-Tube assy 8525015
- 14-Tube assy 8525013
- 15-Tube assy 8524747
- 16-Tube assy 8525016
- 17-Tube assy 8525019

Figure 152. Hydraulic pumping unit assembly network—rear view—removed and installation.

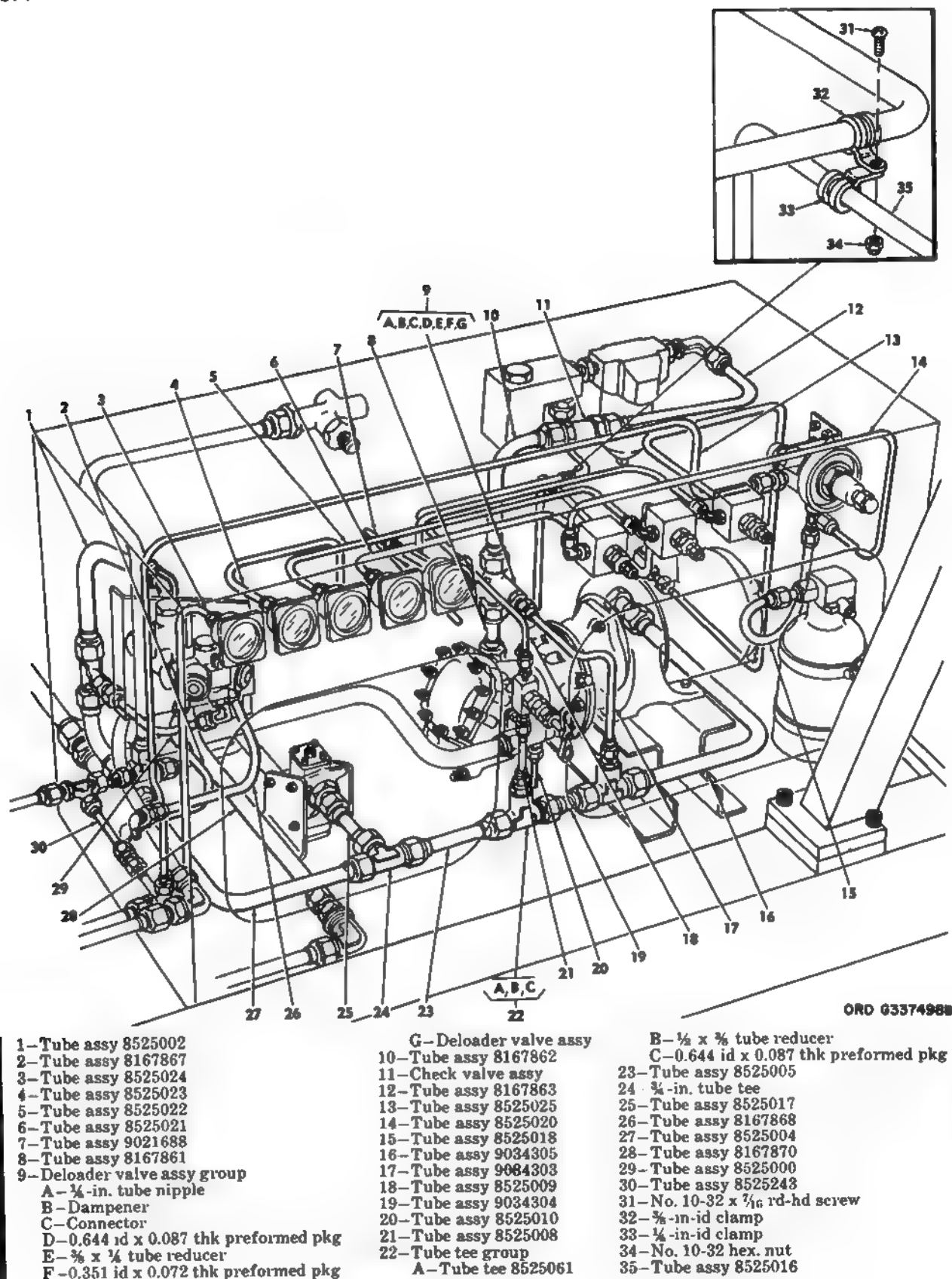


Figure 153. Hydraulic pumping unit assembly work—front view—removal and installation.

right side of the launcher base, behind the hydraulic pumping unit.

*a. Panel Cover (fig. 154).*

(1) *Removal.* Remove the panel cover.

(2) *Installation.* Install the panel cover.

*b. Hydraulic Storage Manifold Group.*

(1) *Removal.*

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove the panel cover (fig. 154).

(d) Disconnect the tube assemblies (fig. 155) attached to the hydraulic storage manifold group.

(e) Remove the hydraulic storage manifold group and cap all open lines.

(2) *Disassembly.* Disassemble the hydraulic storage manifold group.

(3) *Assembly.* Assemble the hydraulic storage manifold group.

(4) *Installation.*

(a) Install the hydraulic storage manifold group.

(b) Connect the tube assemblies (fig. 155) and torque the coupling nuts to the values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167883	1000
8167894	500
8167924	1000
8525035	1000
8525039	1000

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) *Inspection and test.*

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform steps 1 and 2 below.

1. Open the valves and depressurize as outlined in (1)(a) and (b) above.

2. Remove the attaching tube assembly.

(b) Check the tube end and coupling nut and the mating part which attaches to the tube assembly for damage or deformation.

(c) Replace all defective parts and install the tube assembly as outlined in (4)(b) through (d) above.

(d) Install the panel cover (fig. 154).

*c. Up-Lock Manifold Group.*

(1) *Removal.*

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove the panel cover (fig. 154).

(d) Disconnect the tube assemblies attached to the up-lock manifold group (fig. 156).

(e) Remove the up-lock manifold group and cap all open lines.

(2) *Disassembly.* Disassemble the up-lock manifold group.

(3) *Assembly.*

(a) Install the check valve (fig. 156) with the arrow toward the manifold block.

(b) Install the speed control valve with the hexagon nut of the valve downward.

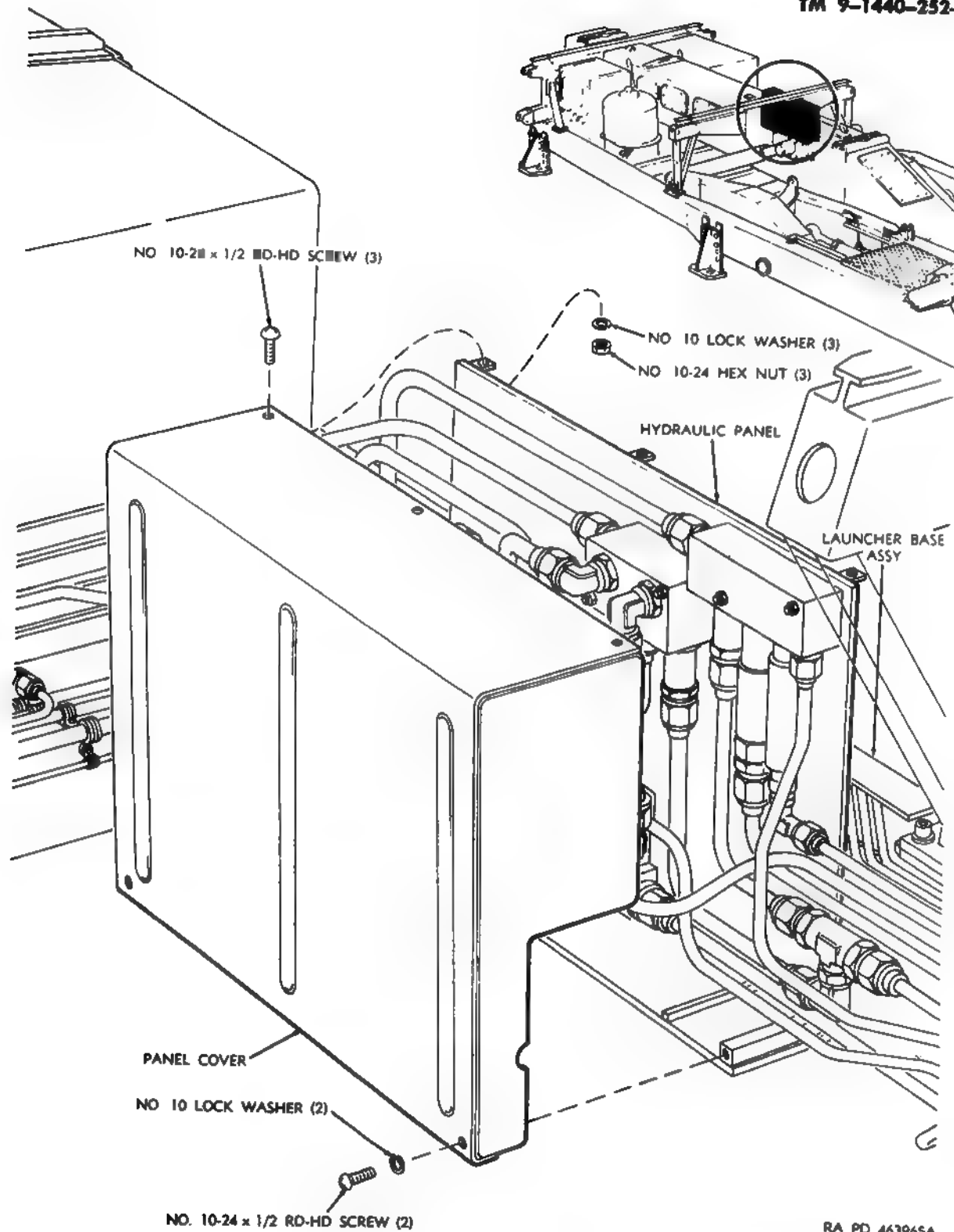
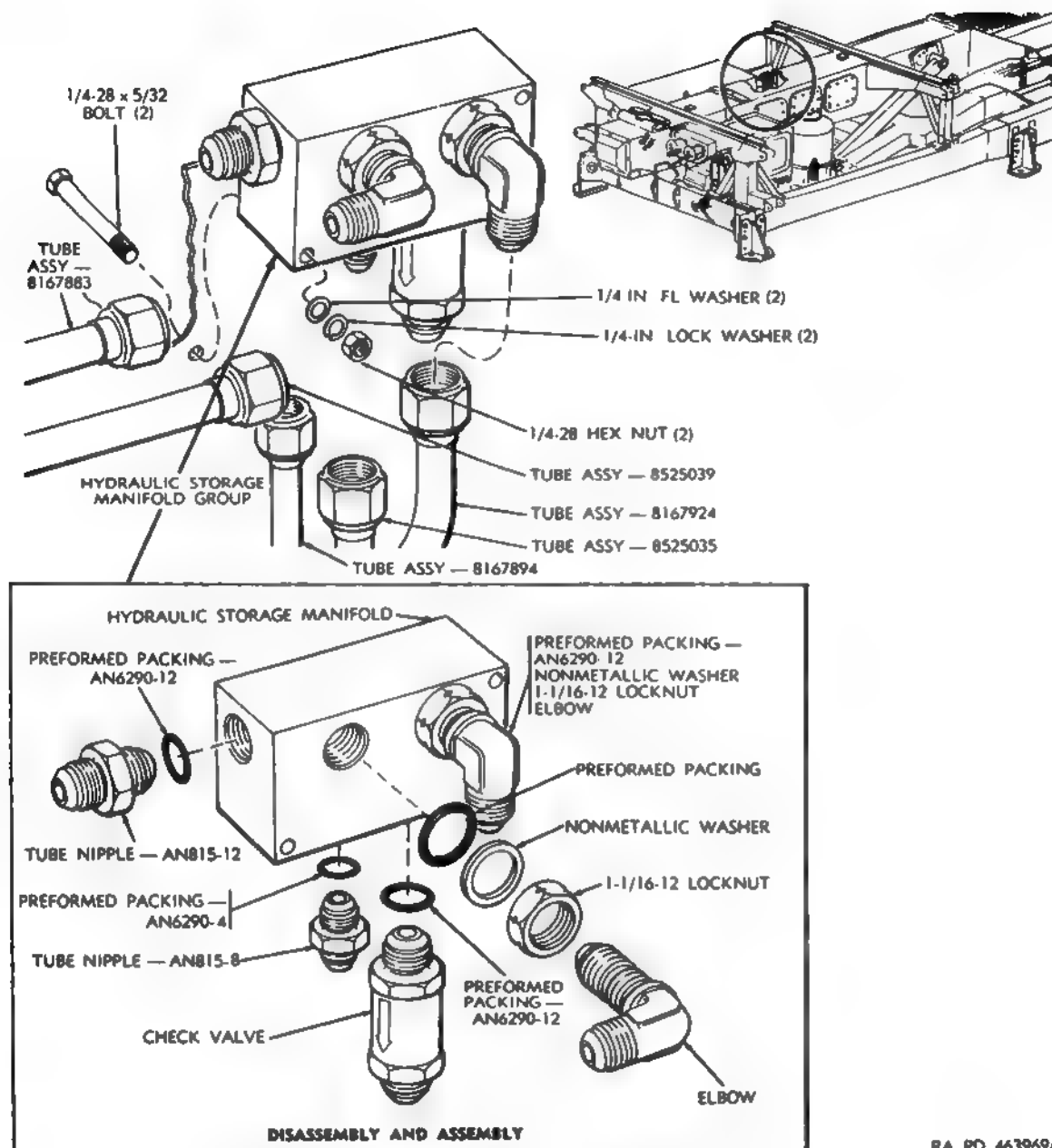


Figure 154. Panel cover—removal and installation.

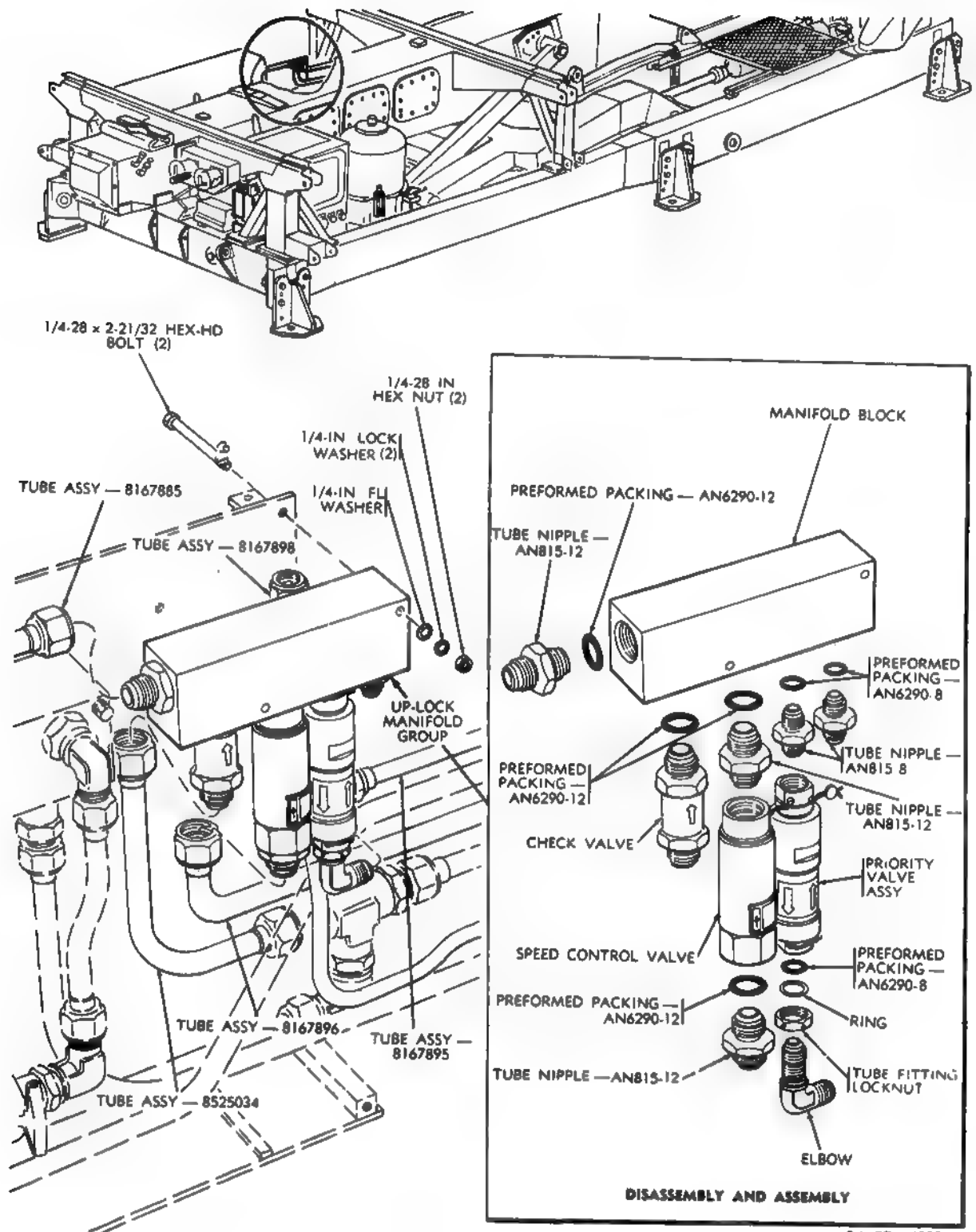


RA PD 463969A

Figure 155. Hydraulic storage manifold group—removal and installation.

- (c) Install tube nipple on speed control valve.
- (d) Install priority valve assembly with RELIEF FLOW (largest) arrow pointing away from the block.

- (e) Install remaining parts of up-lock manifold group.
- (4) Installation.
  - (a) Position and install manifold group on hydraulic panel.



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Figure 156. Up-lock manifold group—removal and installation.

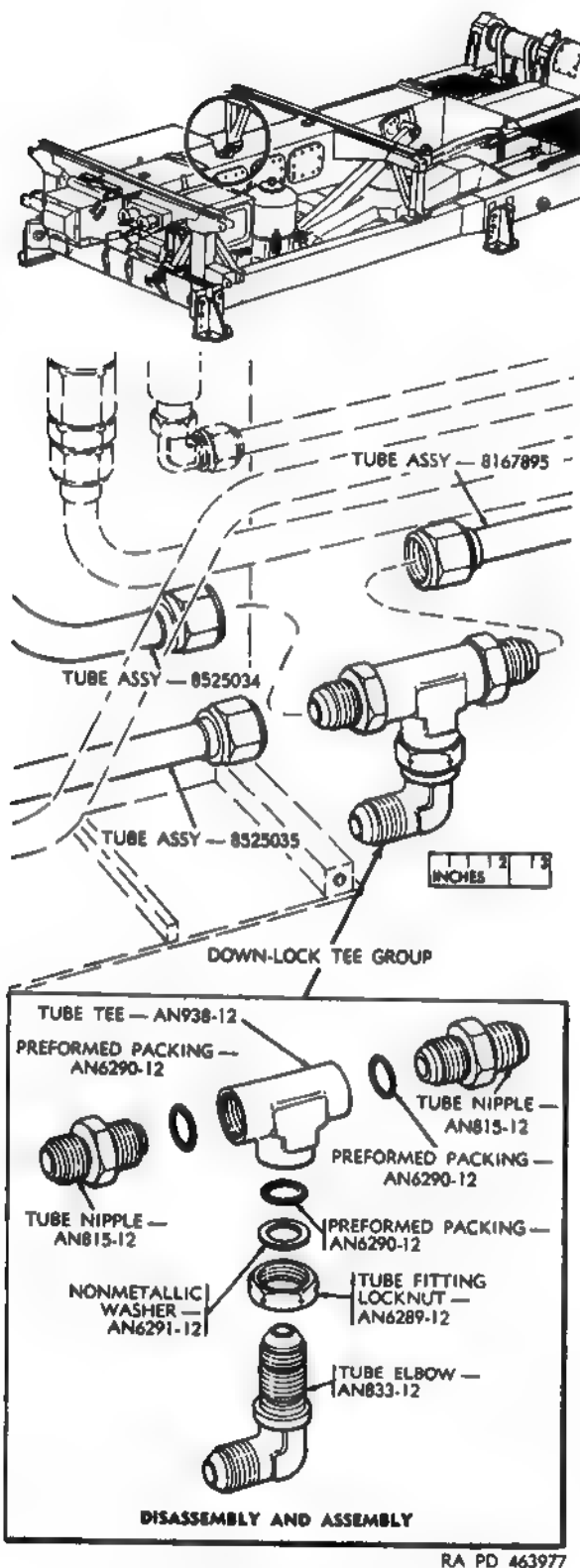


Figure 157. Down-lock tee group - removal and installation.

- (b) Connect five attaching tube assemblies and torque coupling nuts to values specified below:

Tube assembly	Torque value (pound-inches)
8167885	1000
8167895	500
8167896	1000
8167898	500
8525034	1000

- (c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (5) *Inspection and test.*

- (a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching tube assembly (figs. 156, 196, and 200).

- (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 156) for damage or deformation.

- (c) Replace all defective parts and install tube assembly (figs. 155, 196, and 200) as described in (4) (b) through (d) above.

- (d) Install panel cover (fig. 154).

d. *Down-Lock Tee Group.*

(1) *Removal.*

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (c) Remove the panel cover (fig. 154).
- (d) Disconnect three tube assemblies (fig. 157) attached to downlock tee group.

- (e) Remove tee group and cap all open lines.
- (2) *Disassembly.* Disassemble tee group.
- (3) *Assembly.* Assemble down-lock tee group.
- (4) *Installation.*

- (a) Position and install tee group by connecting three attaching tube assemblies. Torque coupling nuts to values specified below:

Tube assembly	Torque value (pound-inches)
8167897	1000
8525034	1000
8525035	1000

- (b) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (c) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (5) *Inspection and test.*

- (a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching tube assembly.

- (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 157) for damage or deformation.

- (c) Replace all defective parts and install tube assembly as described in (4) (a) through (c) above.

- (d) Install panel cover (fig. 154.)

#### e. Down-Lock Manifold Group.

- (1) *Removal.*

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (b) Depressurize the hydraulic oil res-

ervoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

- (c) Remove the panel cover (fig. 154).

- (d) Disconnect pipe and tube assemblies (fig. 158) attached to down-lock manifold group.

- (e) Remove manifold group and cap all open lines.

- (2) *Disassembly.* Disassemble manifold group.

- (3) *Assembly.* Assemble down-lock manifold group.

- (4) *Installation.*

- (a) Position and install manifold group.

- (b) Connect three attaching pipe and tube assemblies and torque coupling nuts to values specified below:

Tube or pipe assembly	Torque value (pound-inches)
8167880	500
8167884	1000
8525037	1000

- (c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

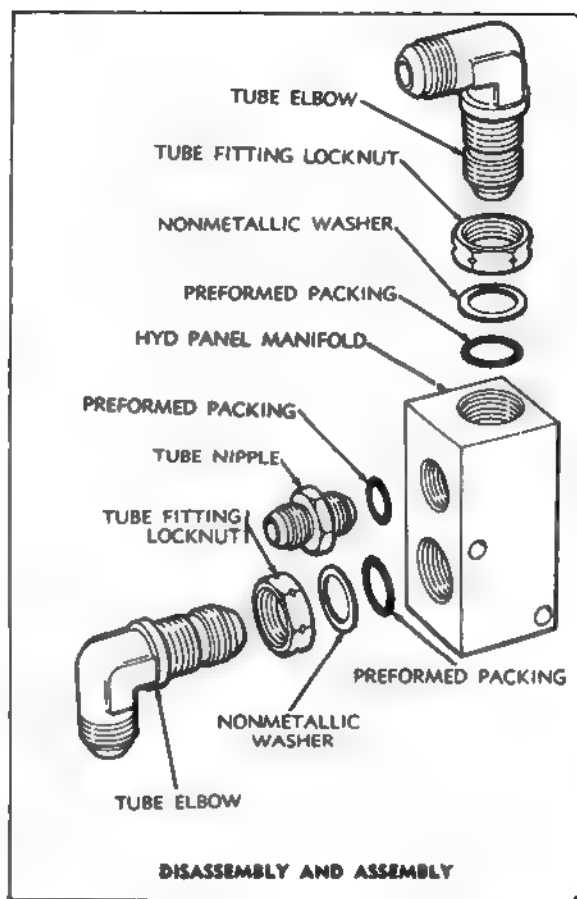
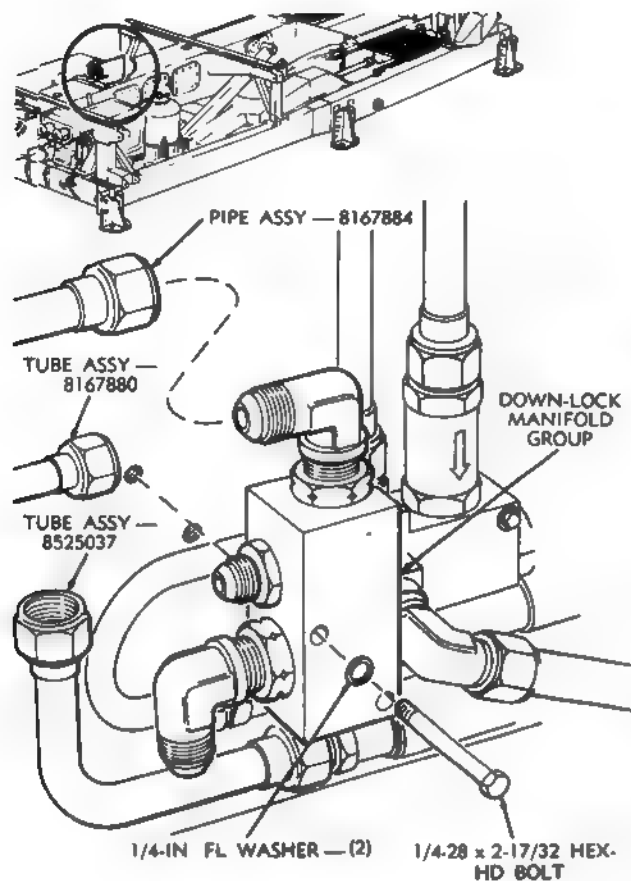
- (5) *Inspection and test.*

- (a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching pipe or tube assembly (figs. 158 and 187).

- (b) Check the pipe or tube end and coupling nut and the mating part which attaches to pipe or tube assembly (fig. 158) for damage or deformation.



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Figure 158. Down-lock manifold group—removal and installation.

- (c) Replace all defective parts and install pipe or tube assembly (figs. 158 and 187) as described in (4) (b) through (d) above.

- (d) Install panel cover (fig. 154).

*f. Down-Lock and Accumulator Manifold Group.*

(1) *Removal.*

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position

and holding until all pressure is discharged.

- (c) Remove the panel cover (fig. 154).

- (d) Disconnect five tube assemblies (fig. 159) attached to down-lock and accumulator manifold group.

- (e) Remove manifold group and cap all open lines.

- (2) *Disassembly.* Disassemble manifold group.

- (3) *Assembly.* Assemble down-lock and accumulator manifold group.

- (4) *Installation.*

- (a) Position and install manifold group.

- (b) Connect five attaching tube assem-

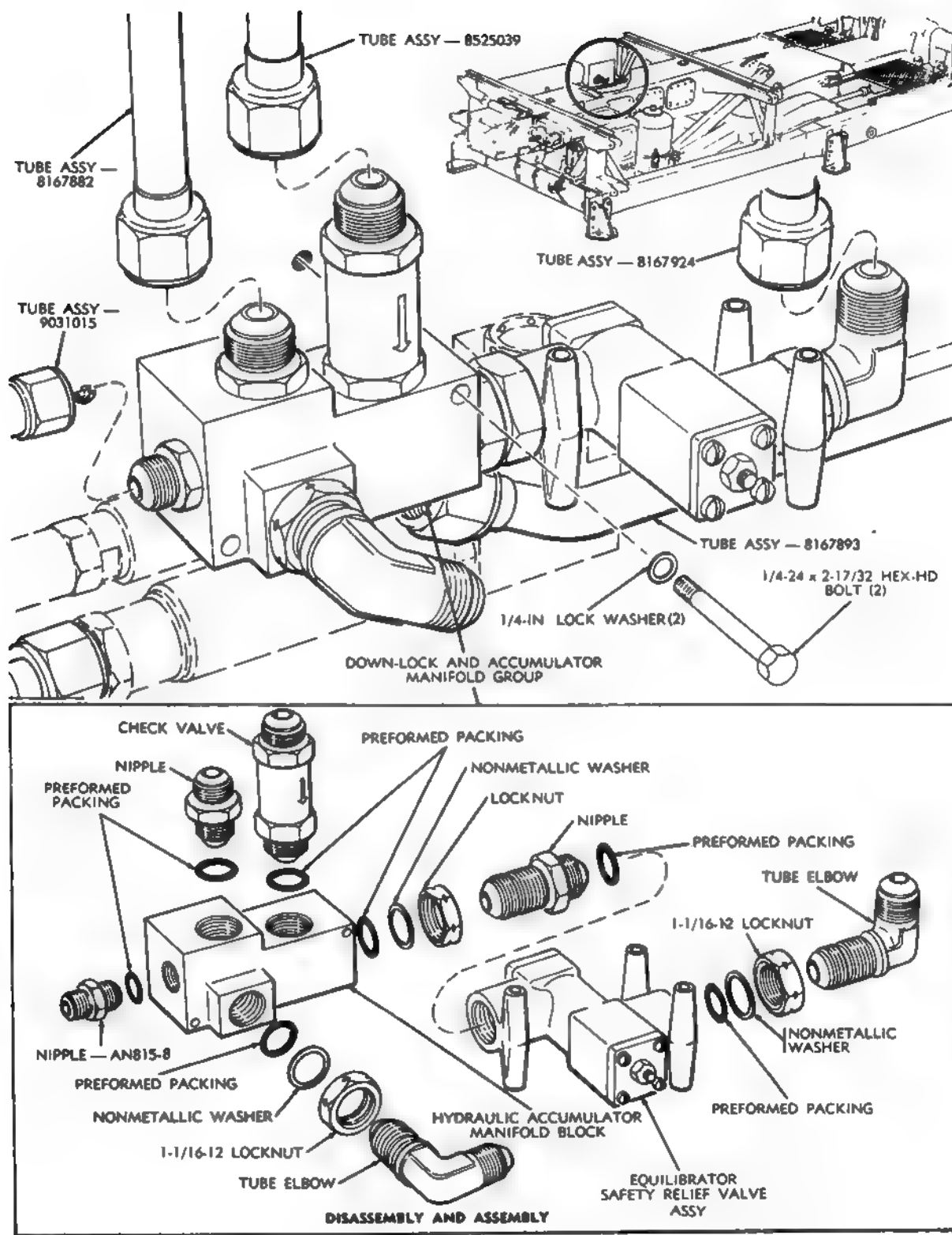


Figure 159. Down-lock and accumulator manifold group—removal and installation.

blies and torque coupling nuts to values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167882	1000
8167893	1000
8167924	1000
8525039	1000
9031015	500

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM PY-PASS valve.

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) *Inspection and test.*

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching tube assembly (figs. 159, 194, and 195).

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 159) for damage or deformation.

(c) Replace all defective parts and install tube assembly (figs. 159, 194, and 195) as described in (4) (b) through (d) above.

(d) Install panel cover (fig. 154).

*g. Cylinder Manifold Group.*

(1) *Removal.*

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove the panel cover (fig. 154).

(d) Disconnect three tube assemblies (fig. 160) attached to cylinder manifold group.

(e) Remove manifold group and cap all open lines.

(2) *Disassembly.* Disassemble the manifold group.

(3) *Assembly.* Assemble cylinder manifold group.

*Note.* Install priority valve assembly with RELIEF FLOW (larger) arrow pointing away from the hydraulic cylinder manifold. Install speed control valve with REGULATED FLOW arrow pointing away from manifold. Install check valve with arrow pointed away from manifold.

(4) *Installation.*

(a) Position and install manifold group.

(b) Connect three tube assemblies and torque coupling nuts to values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167899	1000
8525087	1000
9031015	500

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve (fig. 60).

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

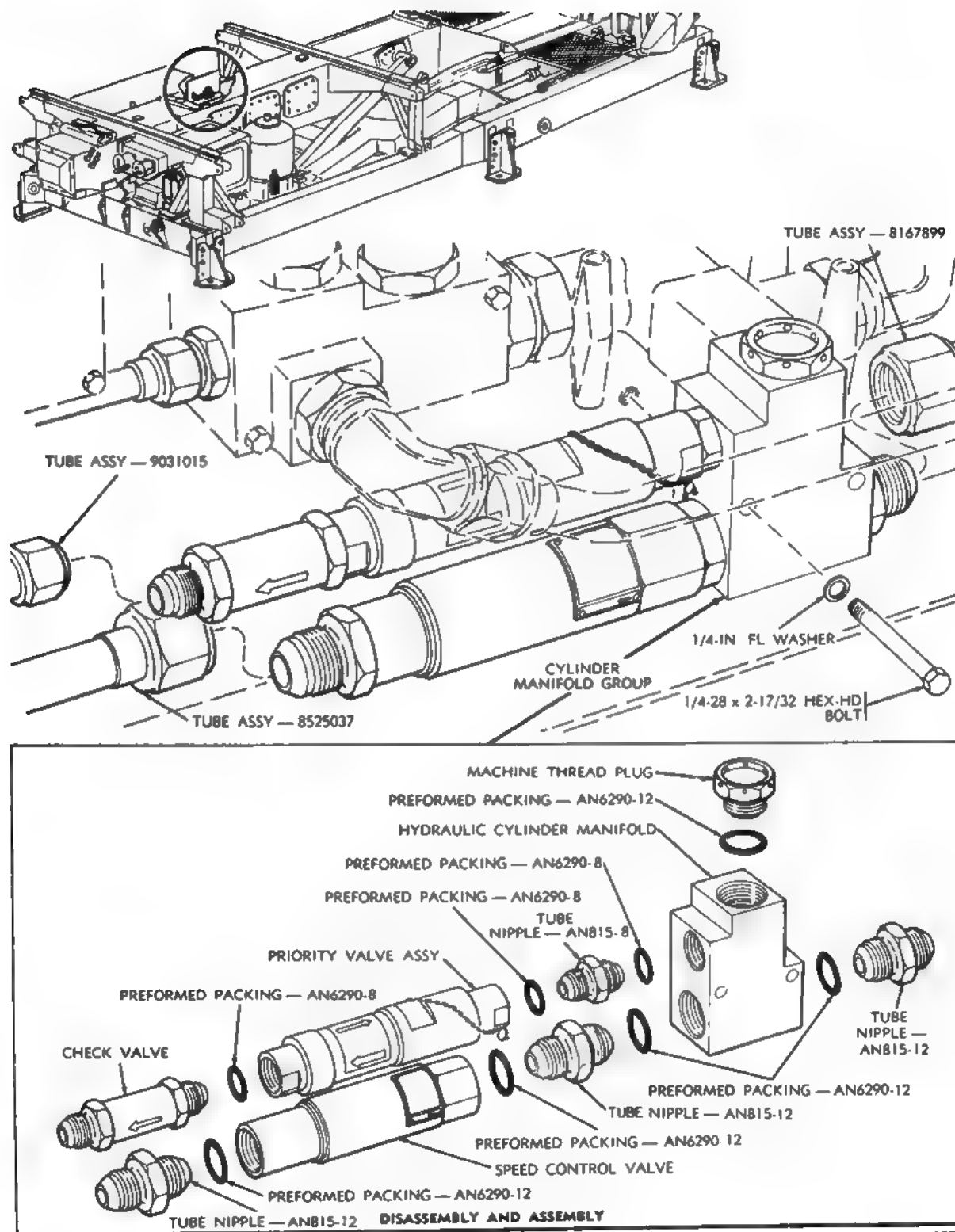
(5) *Inspection and test.*

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

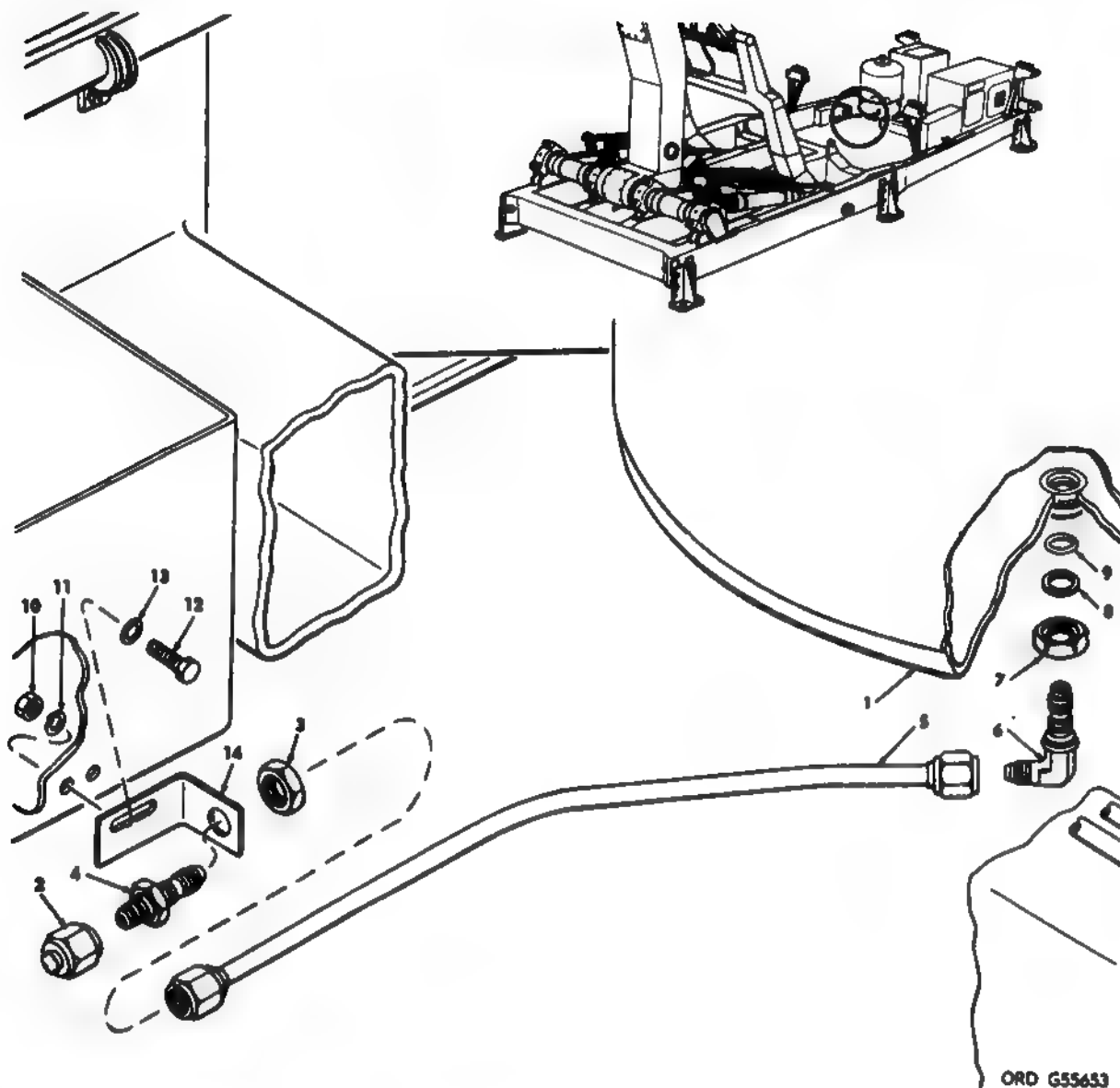
2. Remove attaching tube assembly (figs. 160 and 189).

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 160) for damage or deformation.



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Figure 160. Cylinder manifold group—removal and installation.



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- 1—Hydraulic oil reservoir assembly
- 2—Cap
- 3—9/16-18 hexagon nut
- 4—Nipple
- 5—Drain tube assembly
- 6—Elbow
- 7—9/16-18 locknut

- 8—0.468-id x 0.072-od nonmetallic washer
- 9—Preformed packing
- 10—No. 10-32 hexagon nut (2)
- 11—No. 10 lockwasher (2)
- 12—No. 10-32 x 2 1/32 hexagon-head bolt (2)
- 13—No. 10 flat washer (2)
- 14—Bracket

Figure 161. Drain tube assembly—removal and installation.

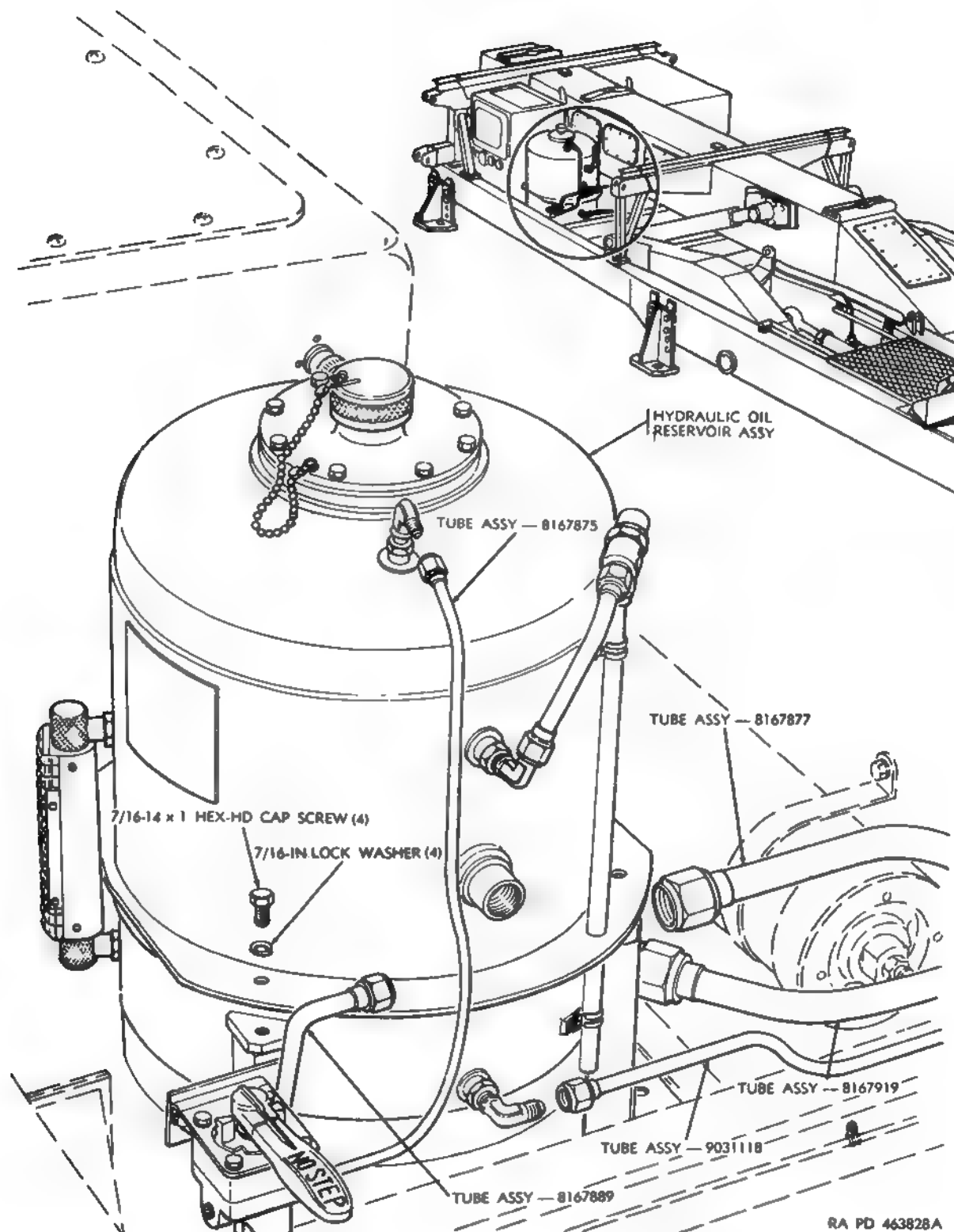
- (c) Replace all defective parts and install tube assembly (figs. 160 and 189) as described in (4) (b) through (d) above.

- (d) Install panel cover (fig. 154).

## 82. Hydraulic Oil Reservoir Assembly

The hydraulic oil reservoir (fig. 8) is located on the left side of the launcher base.

*Notes.* The key numbers in parentheses in a.1 and a.2 below refer to figure 161 unless otherwise indicated.



RA PD 463828A

Figure 162. Hydraulic oil reservoir assembly—removal and installation.

**a. Drain Procedure.**

- (1) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.
- (2) Depressurize the hydraulic oil reservoir (fig. 60) by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

*Note.* The hydraulic fluid capacity of the hydraulic oil reservoir is approximately 20 gallons. Provide a container to hold this fluid before removing cap (2).

- (3) Remove cap (2).
- (4) Drain the hydraulic fluid into container and discard fluid.
- (5) Replace cap (2) and torque to  $270 \pm 25$  pound-inches.

**a.1. Drain Tube Assembly.****(1) Removal.**

- (a) Drain hydraulic oil reservoir assembly (1) as described in *a* above.
- (b) Remove drain tube assembly (5).

- (2) **Installation.** Install drain tube assembly (5) and torque all connections to  $270 \pm 25$  pound-inches.

**a.2. Refill Procedures.**

- (1) Fill the hydraulic oil reservoir assembly (1) to the full mark with hydraulic fluid as specified in paragraph 37a.
- (2) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

**b. Hydraulic Oil Reservoir Assembly.****(1) Removal.**

*Note.* The extent of maintenance required on the hydraulic oil reservoir assembly (fig. 162) determines whether its removal is necessary.

**Caution:** Be careful not to damage the attached pipe or tube assemblies when removing or installing the reservoir assembly.

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (b) Drain the hydraulic oil reservoir assembly (fig. 162) as described in *a* above.

- (b.1) Remove drain tube assembly (5, fig. 161) as described in *a.1(1)* above.

- (c) Remove tube assemblies—8167875, 8167877, and 9031118 (fig. 162), disconnect tube assemblies—8167919 and 8167889. Cap all open lines.

- (d) Remove reservoir tee group (fig. 167).

- (e) Remove the reservoir assembly (fig. 162).

**(2) Installation.**

- (a) Position and install the hydraulic oil reservoir assembly (fig. 162).

- (b) Install drain tube assembly (5, fig. 161) and torque all connections to  $270 \pm 25$  pound-inches.

- (c) Install reservoir tee group (fig. 167).

- (d) Install and connect tube assemblies (fig. 162) and torque coupling nuts to values specified below:

Tube assembly	Torque value (pound-inches)
8167875	300
8167877	1450
8167889	500
8167919	1450
9031118	300

- (e) Fill the reservoir assembly to the FULL mark with hydraulic fluid as specified in paragraph 37a.

- (f) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (g) Pressurize the reservoir assembly to 20 psi by turning the handle of the plug cock to the AIR position.

**c. Reservoir Cap Assembly.** The reservoir cap assembly (fig. 163) screws on to the top of the hydraulic oil reservoir assembly.

**(1) Removal.**

- (a) Depressurize the hydraulic oil reservoir (fig. 60) by turning the handle of the plug cock to the

VENT position and holding until all pressure is discharged.

- (b) Remove cap assembly (fig. 163) and preformed packing.

(2) *Installation.*

- (a) Install preformed packing and reservoir cap assembly.
- (b) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

d. *Reservoir Cover Group.*

(1) *Removal.*

- (a) Depressurize the hydraulic oil reservoir (fig. 60) by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (b) Remove cover group (fig. 164).
- (c) Remove knurled nut and fluid filter.

(2) *Installation.*

- (a) Install reservoir cover group.

Torque eight ¼-28 x 2½ hexagon-head cap screws to 35 pound-inches.

- (b) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

e. *Internal Pipe Assemblies.*

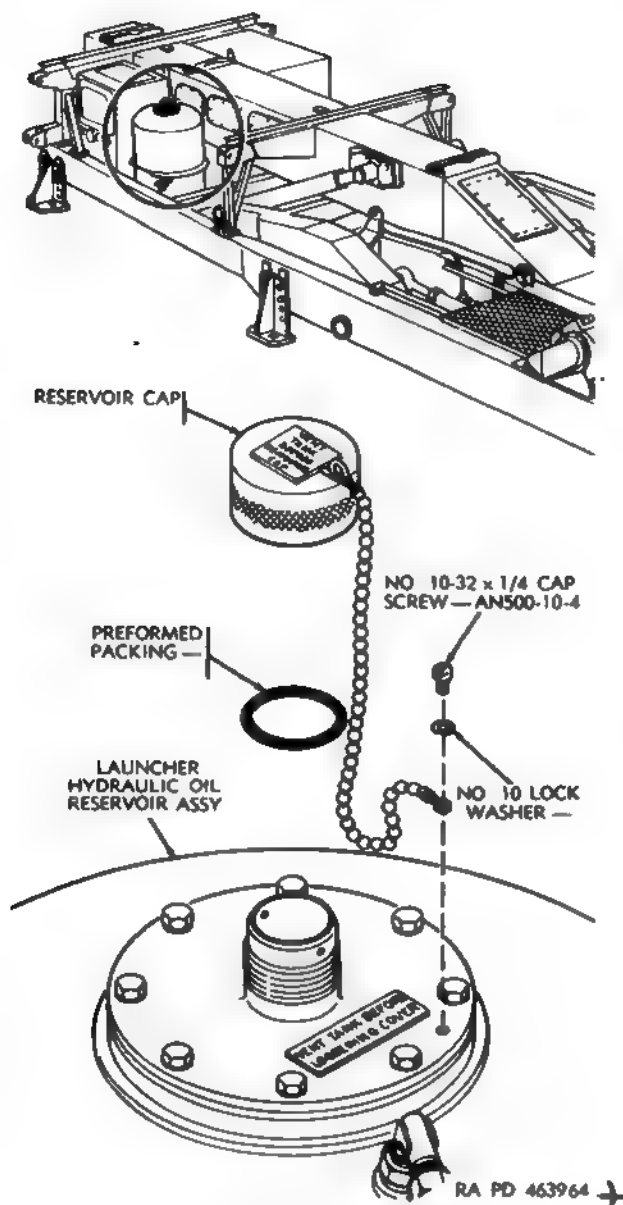
(1) *Removal.*

- (a) Drain hydraulic oil reservoir assembly as described in a above.
- (b) Remove the reservoir cover group (fig. 164).
- (c) Disconnect and remove pipe assembly (fig. 165) and nipple from reservoir assembly as required. Cap open lines and outlet port.

(2) *Installation.*

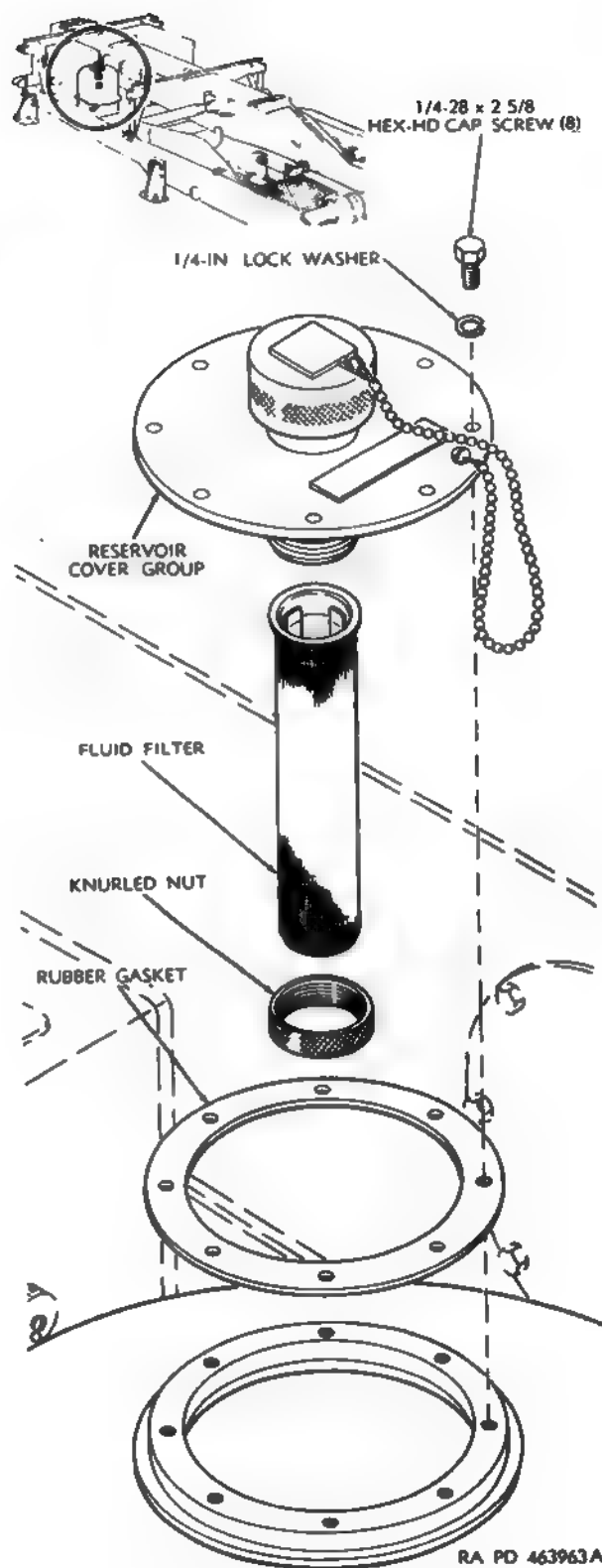
- (a) Connect nipple to outlet port.
- (b) Install pipe assemblies and torque coupling nuts to 400 pound-inches.
- (c) Install reservoir cover group (fig. 164) and torque the eight ¼-28 x 2½ hexagon-head cap screws to 35 pound-inches.





**Figure 163. Reservoir cap assembly—removal and installation.**

- (d) Install cap (2, fig. 161) and torque to  $270 \pm 25$  pound-inches.
- (e) Fill the reservoir assembly to the FULL mark with hydraulic fluid as specified in paragraph 37a.
- (f) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.



**Figure 164. Reservoir cover group—removal and installation.**

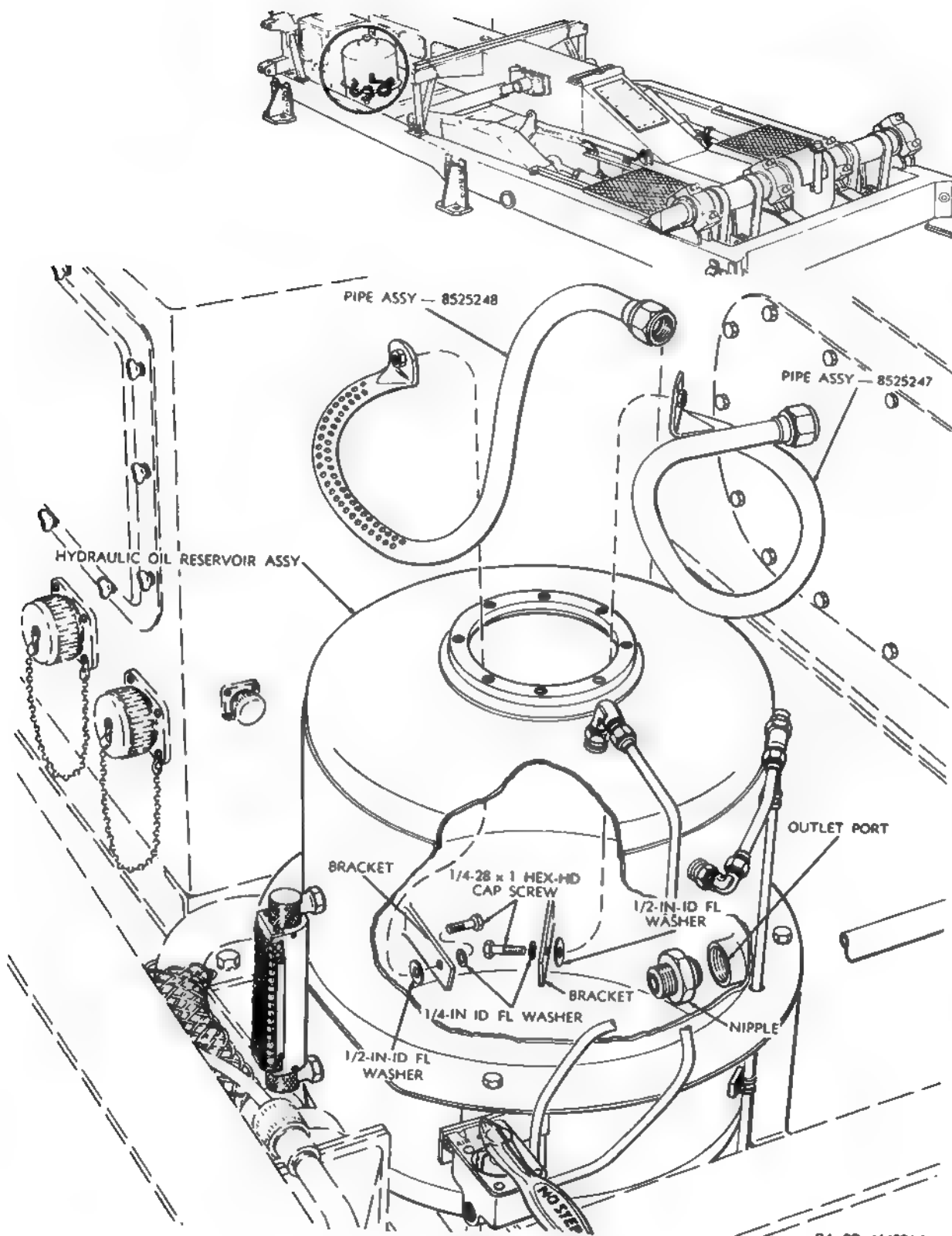


Figure 165. Internal pipe assemblies—removal and installation.

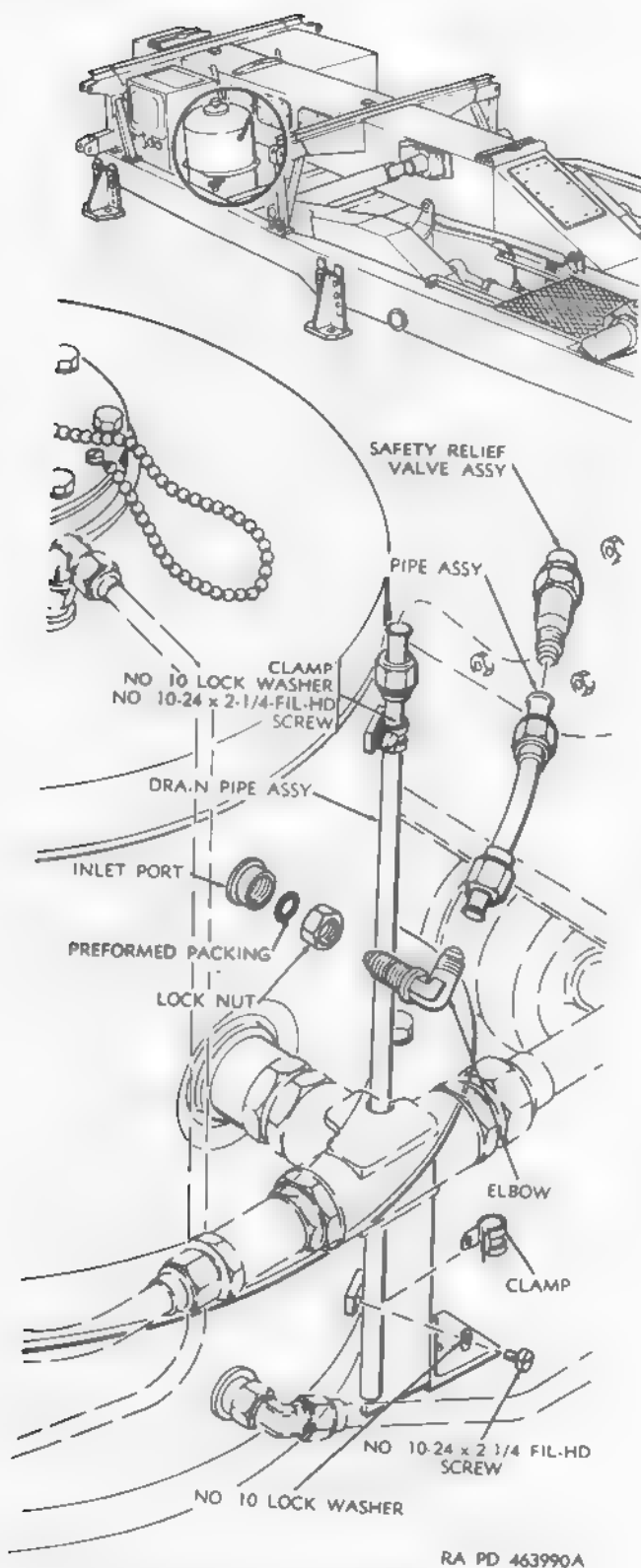


Figure 166. Safety relief valve assembly and drain pipe assembly—removal and installation.

#### f. Safety Relief Valve.

##### (1) Removal.

- (a) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock (fig. 60) to the VENT position and holding until all pressure is discharged.
- (b) Remove the drain pipe assembly (fig. 166).
- (c) Remove elbow, pipe assembly, and safety relief valve assembly. Cap open lines and inlet port.

##### (2) Installation.

- (a) Install elbow, preformed packing, and locknut.
- (b) Install pipe assembly, drain pipe assembly, and safety relief valve assembly. Torque the coupling nut on pipe assembly—8167952 to 300 pound-inches and the coupling nut of the drain pipe assembly to 112 pound-inches.
- (c) Install the clamps.
- (d) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

#### g. Reservoir Tee Group.

##### (1) Removal.

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (b) Drain the hydraulic oil reservoir assembly as described in *a* above.
- (c) Disconnect tube assembly—8167889 (fig. 167) and remove tube assembly—8167877.
- (d) Remove tee group; cap all open lines and return port.

##### (2) Disassembly (fig. 168). Disassemble tee group.

##### (3) Assembly. Assemble reservoir tee group.

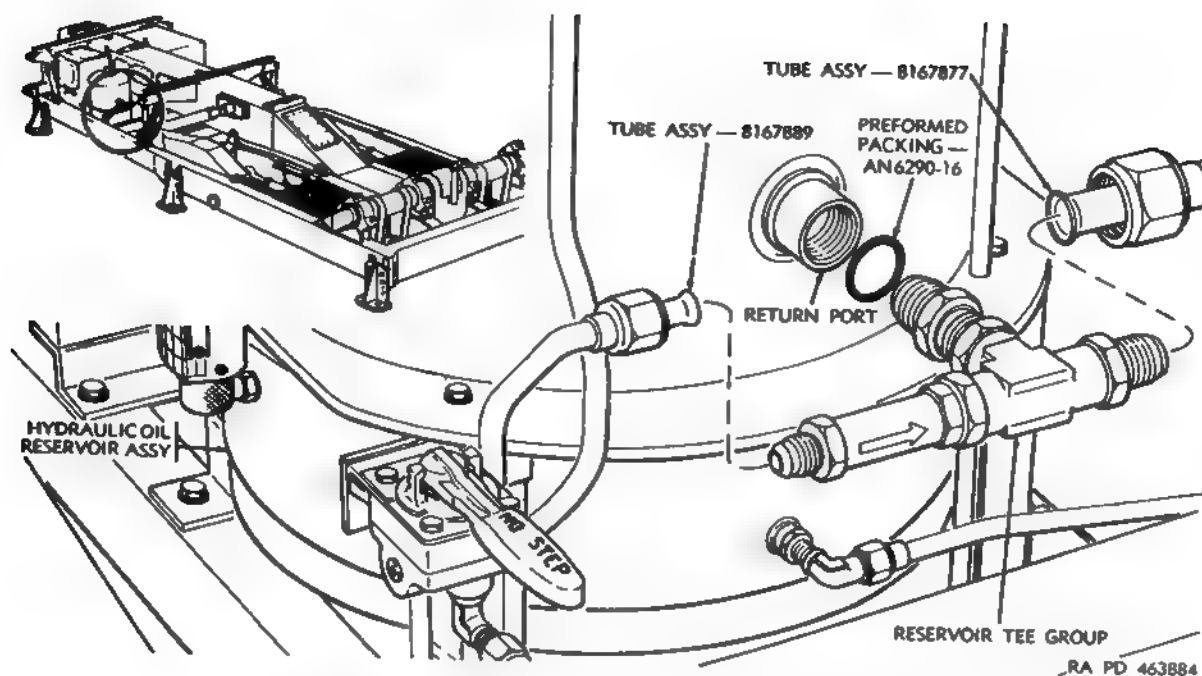


Figure 167. Reservoir tee group - removal and installation.

#### (4) Installation.

- (a) Install tee group (fig. 167) on hydraulic oil reservoir assembly and connect and install two pipe assemblies. Torque coupling nut on pipe assembly - 8167889 to 500 pound-inches and 8167877 to 1450 pound-inches.
- (b) Install cap (2, fig. 161) and torque to  $270 \pm 25$  pound-inches.
- (c) Fill the reservoir assembly to the FULL mark with hydraulic fluid as specified in paragraph 37a.
- (d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

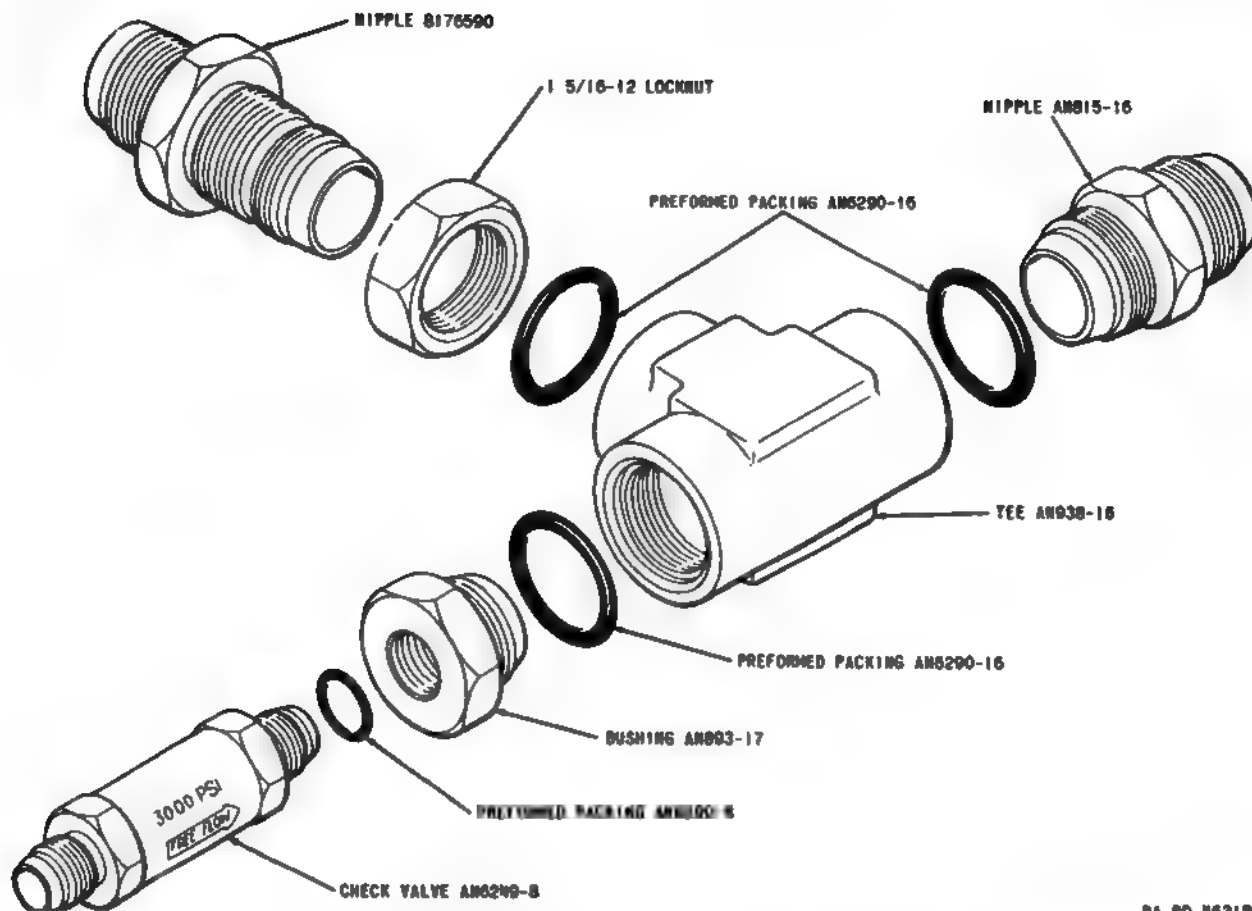
#### h. Liquid Sight Indicator Group.

##### (1) Removal.

- (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
  - (b) Drain the hydraulic oil reservoir assembly as described in a above.
  - (c) Remove the reservoir cover group (fig. 164).
  - (d) Remove liquid sight indicator group (fig. 169).
- (2) **Disassembly.** Remove nipples and preformed packings from indicator group.
  - (3) **Assembly.** Attach nipples and preformed packings to liquid sight indicator group.
- Note.* Each nipple has two threaded shanks. One shank is long and the other is short. The short shank fits into the liquid sight indicator assembly.

##### (4) Installation.

- (a) Install indicator group.
- (b) Install cap (2, fig. 161) and torque to  $270 \pm 25$  pound-inches.



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Figure 168. Reservoir tee group - disassembly and assembly.

- (c) Fill the hydraulic oil reservoir assembly to the FULL mark with hydraulic fluid as specified in TM 9-1440-250-20/1.
- (d) Install the reservoir cover group (fig. 164) and torque the eight  $\frac{1}{4}$ -28 x 2 $\frac{1}{2}$  hexagon-head cap screws to 35 pound-inches.
- (e) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (f) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

### 83. Equilibrator Accumulator Group

The equilibrator accumulator group (fig. 170) is located on the launcher base assembly, to the left of the hydraulic pumping unit assembly.

#### a. Removal.

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Depressurize the equilibrator accumulator as described in paragraph 41d.
- (4) Disconnect the tube assembly and

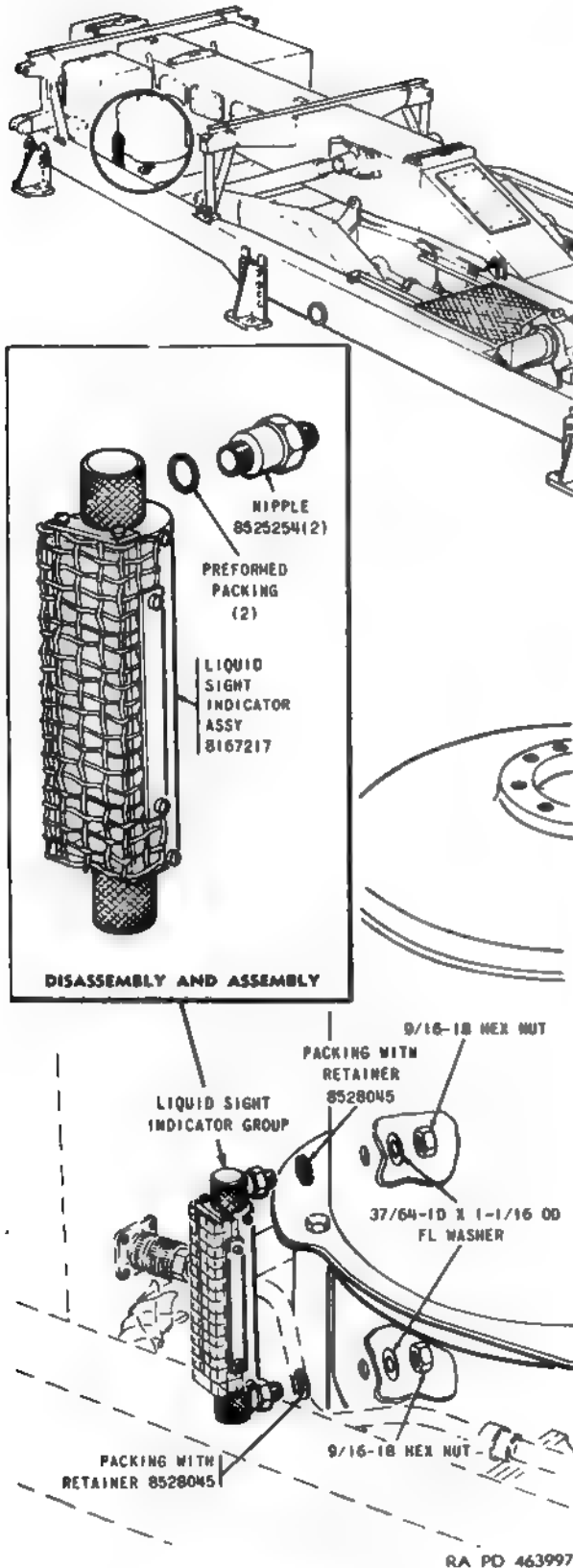


Figure 169. Liquid sight indicator group—removal and installation.

pipe assembly from the accumulator group.

- (5) Remove the accumulator group; cap both open hydraulic lines.

*b. Disassembly.*

- (1) Disassemble the accumulator group (fig. 171).
- (2) Disassemble the accumulator assembly (fig. 171 or 172).

*c. Assembly of Equilibrator Accumulator Assembly 8528083.*

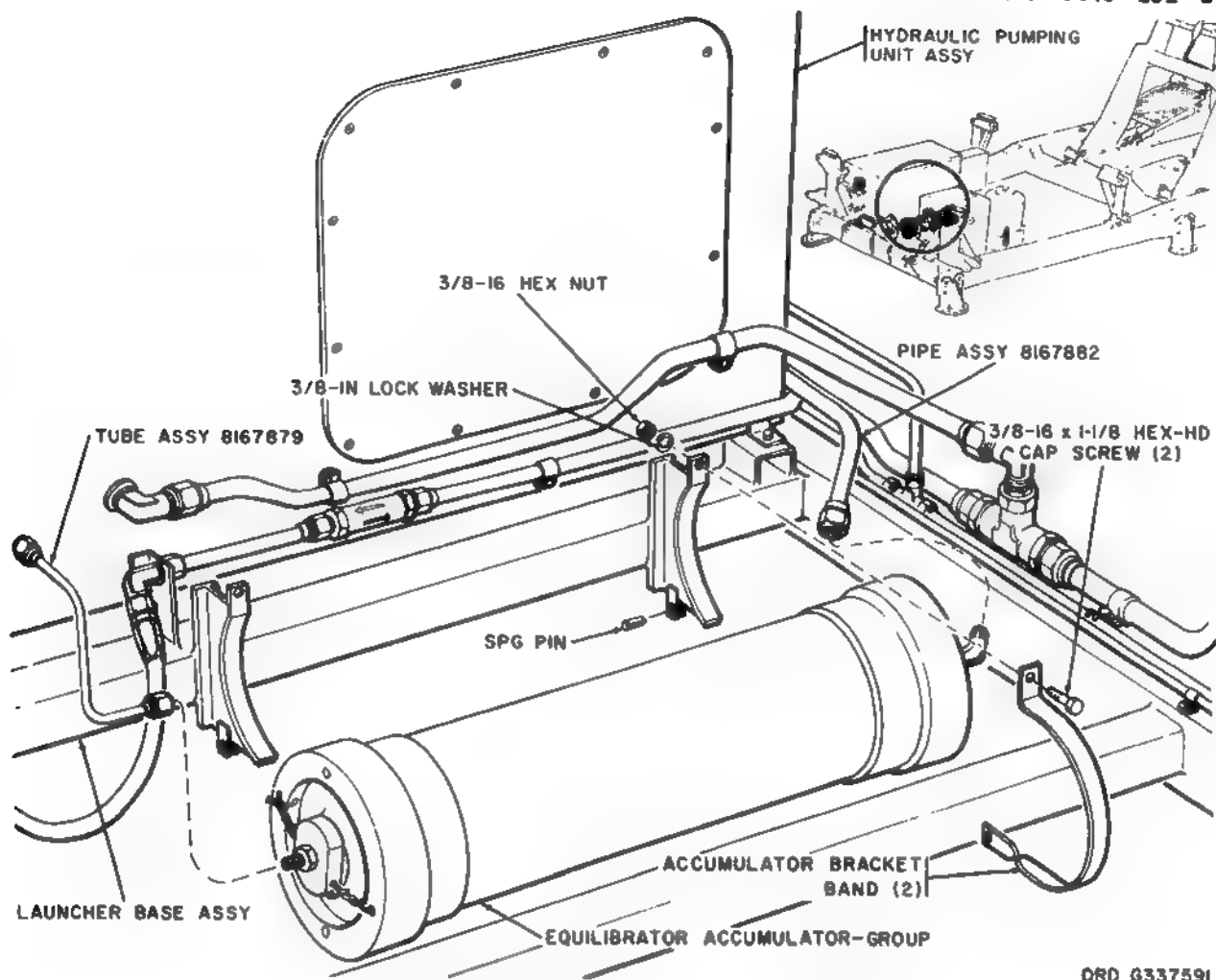
- (1) Install a 6- $\frac{3}{4}$ -in-id preformed packing (fig. 171), in the center recess of the piston and a 6- $\frac{3}{4}$ -in-id preformed packing in each outside recess of the piston.
- (2) Install the nipple, elbow, locknut, all preformed packings, and non-metallic washers on the end caps.
- (3) Position the air end cap on the shell so that the pin in the cap fits in the slot of the shell.
- (4) Install and tighten the nut; safety the nut with steel lockwire.

*Note.* There are two sides to the piston: one is flat and the other is curved. The curved side must face the air end cap.

- (5) Insert the piston in the shell.
- (6) Position the hydraulic end cap on the shell so that the pin in the cap fits in the slot of the shell.
- (7) Install and tighten the nut; safety the nut with steel lockwire.
- (8) Assemble the equilibrator accumulator group (fig. 171).
- (9) Pour at least one gallon of hydraulic fluid as specified in TM 9-1440-250-20/1, into the hydraulic port of the accumulator group and plug the port. This prevents fluid spillage during handling of the accumulator group.

*d. Assembly of Equilibrator Accumulator Assembly 9022271.*

- (1) Assemble the fittings (fig. 172) on both end caps.
- (2) Install the two T-rings on the piston and one on each end cap.



ORD 6337591

Figure 170. Equilibrator accumulator group—removal and installation.

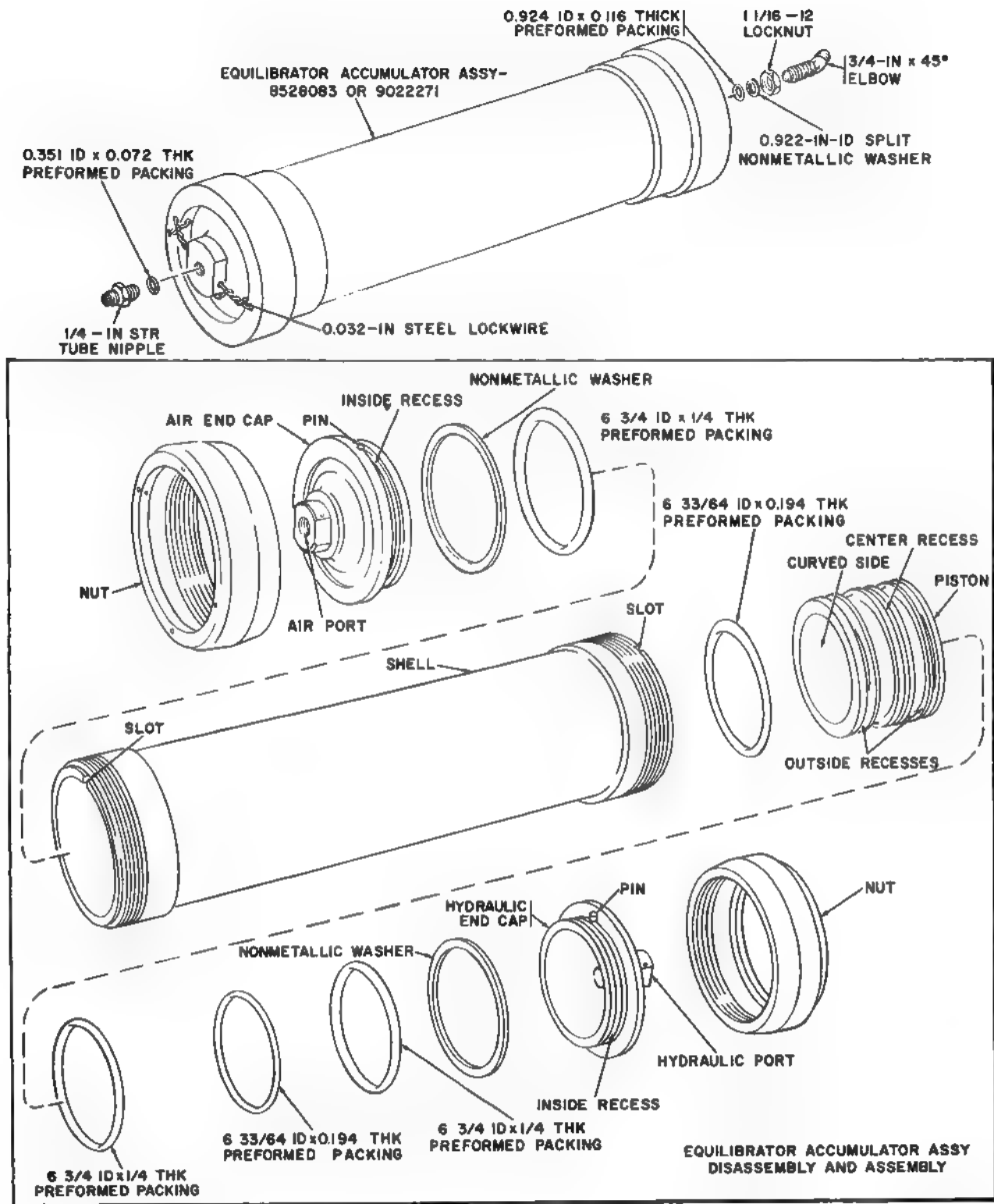
- (3) Install the air end cap and nut. Tighten the nut until it bottoms against the end cap.

*Note.* There are two sides to the piston: one is flat and the other is curved. The curved side must face the air end cap.

- (4) Insert the piston in the cylinder.
- (5) Install the hydraulic end cap and nut. Tighten the nut until it bottoms

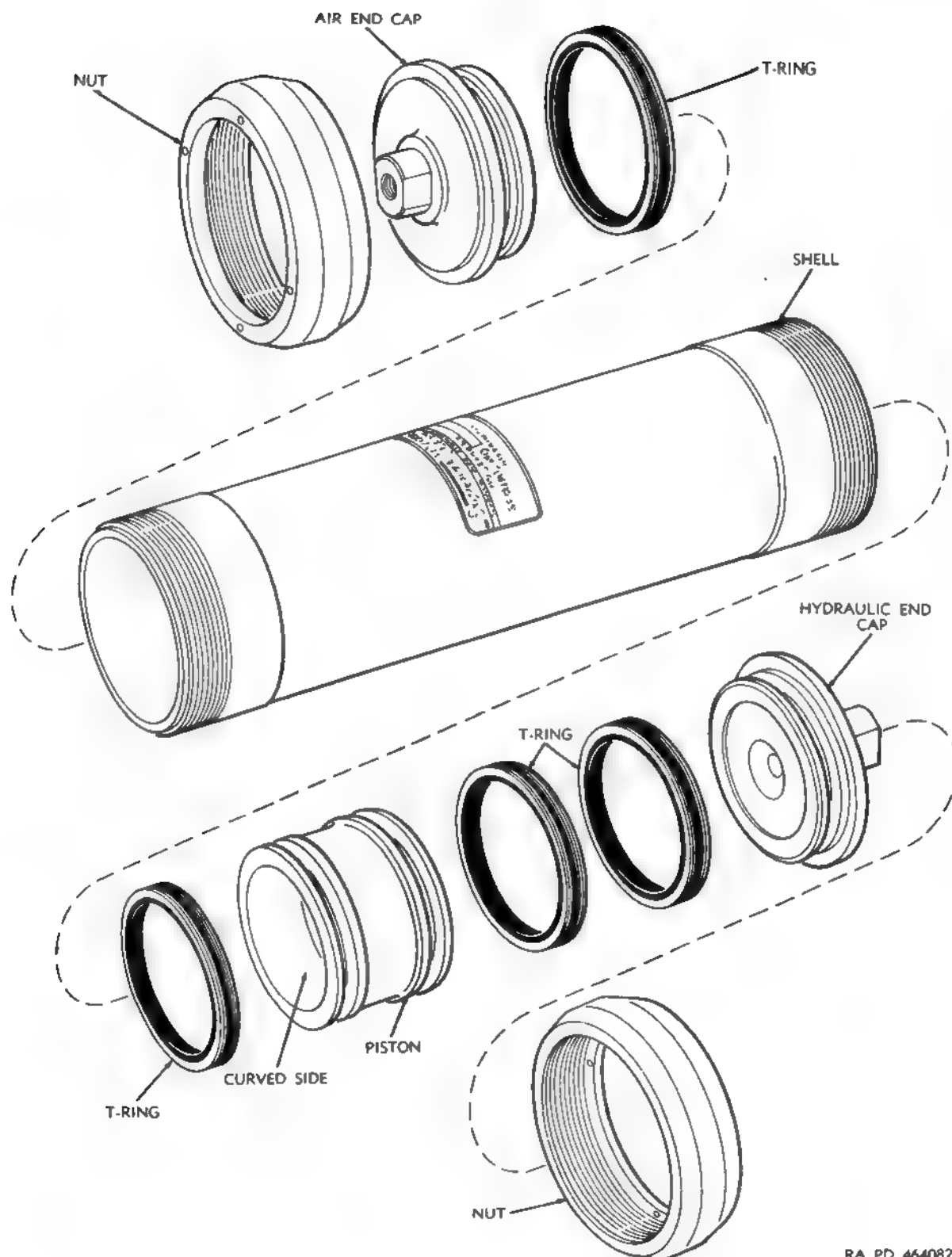
against the end cap.

- (6) Assemble the equilibrator accumulator group (fig. 171).
- (7) Pour at least one gallon of hydraulic fluid as specified in paragraph 37a into the hydraulic port of the accumulator group and plug the port. This prevents fluid spillage during handling of the accumulator group.



ORD 6337592

Figure 171. Equilibrator accumulator group - disassembly and assembly.



RA PD 464082A

Figure 172. Equilibrator accumulator assembly 9022271—disassembly and assembly.

*e. Inspection and Final Test.*

**Warning:** The air leak portion of the final test must be performed with the UUT placed in a sand bag barricade as shown in figure 172.2 for observer protection during performance of the air leak test.

- (1) Perform a visual inspection of the UUT (equilibrator accumulator group—fig. 170) for completeness of

assembly and for nicks, scratches, fractures, or other damage. Correct any deficiencies before proceeding with the final test.

- (2) The test equipment required for the final test is listed in table XII.1.

*Note.* The final test is composed of two parts. Part 1 checks the UUT for internal and external air leakage. Part 2 checks the UUT for internal and external oil leakage and for piston movement.

Table XII.1. Air-Oil Leak Test Equipment

Panel	Equipment	Part no.	Operating instructions
For Part 1.			
A	Air control cabinet	8020349	TM 9-9502-10
		or	
		8163240	
		or	
		9027215	
	Aural protector, sound, type 1	4240-00-691-5617	
		or	
		4240-00-759-3290	
B	Container, 40 x 12 x 12 inches large enough to contain the UUT completely submerged in MIL-H-5606 hydraulic fluid.	Fabricate	
	Elbow	8161470	
	Gasket	8002799	
	Hose Assembly	MS28759-4-072	
	Mirror, stainless steel, 10 x 16 inches large enough for observer to view surface of hydraulic fluid in container.	Fabricate	
	Nut	8176327	
	Sand bags: enough to erect a barricade three feet high around the container.	Fabricate	
	Washer	7384284	

Table XII.1. Air-Oil Leak Test Equipment - Continued

Panel	Equipment	Part no.	Operating instructions
For Part 2.			
A	Air control cabinet	8020349 or 8163240 or 9027215	TM 9-9502-10
	Bushing	9018108	
	Coupling	8168948	
	Gasket	8002799	
	Gasket	8034009	
	Hose assembly	MS28759-4-072	
	Hose Assembly	8169537	
	Nipple	8161484	
	Packing	MS28778-4	
	Reducer	8168774	
C	Test Stand, missile, components hydraulic	8523711	
			TM 9-4935-254-15

Note. Refer to TM 9-9502-13 for installation and operating instructions.

(3) Preparation for final test—Part 1.

- (a) Bottom the piston against the oil-end of the UUT.
- (b) Connect the test equipment to the UUT (fig. 172.1).
- (c) Place the UUT in the empty container.
- (d) Fill the container with enough hydraulic fluid (MIL-H-5606) to completely cover the UUT.
- (e) Erect the sandbag barricade to a height of about 3 feet around the container. The sand bags should be stagger stacked (fig. 172.2) for strength and stability of the barricade.
- (f) Place the stainless steel mirror about 2 feet above the opening at the top of the barricade (fig. 172.3)

and orient it so that the surface of the hydraulic fluid in the container may be observed from the safety zone.

- (g) On panel A, close the 3500 PSI BLEED valve.
  - (h) All other controls will be in the closed (OFF) position.
- (4) Final inspection standard—Part 1.

Warning: Do not view the UUT directly while performing the air leak test with high pressure air. All observations must be made via the stainless steel mirror from the observation area outside of the danger zone (fig. 172.3).

- (a) Position the controls and perform the air leakage test as prescribed in table XII.2. The indications must be as given.

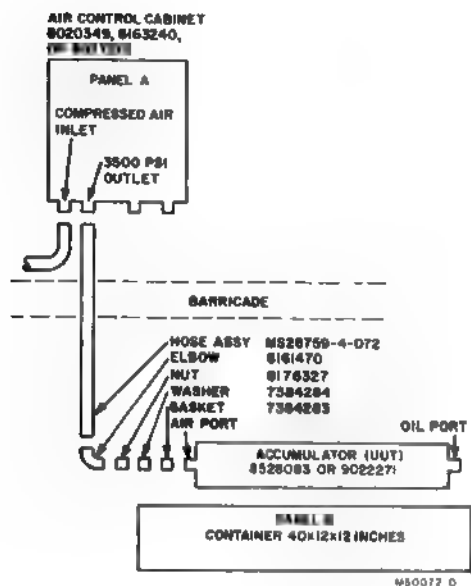


Figure 172.1. Air leak test diagram.

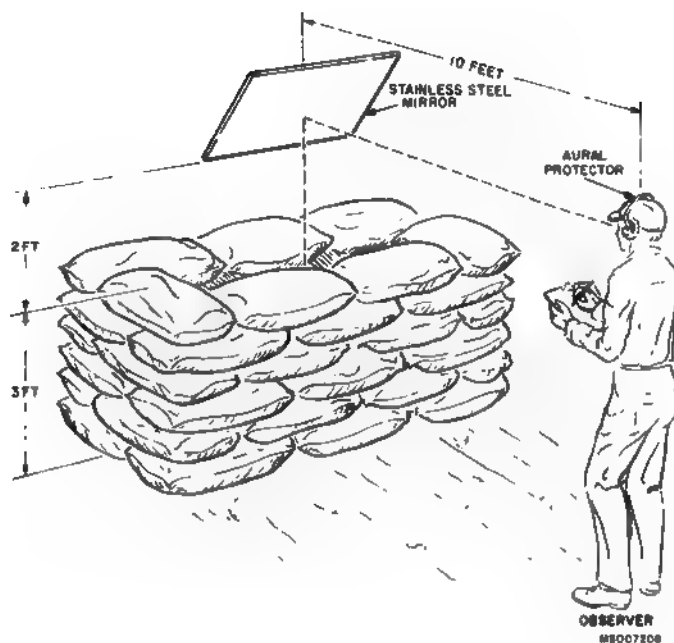


Figure 172.2. Sand bag barricade.

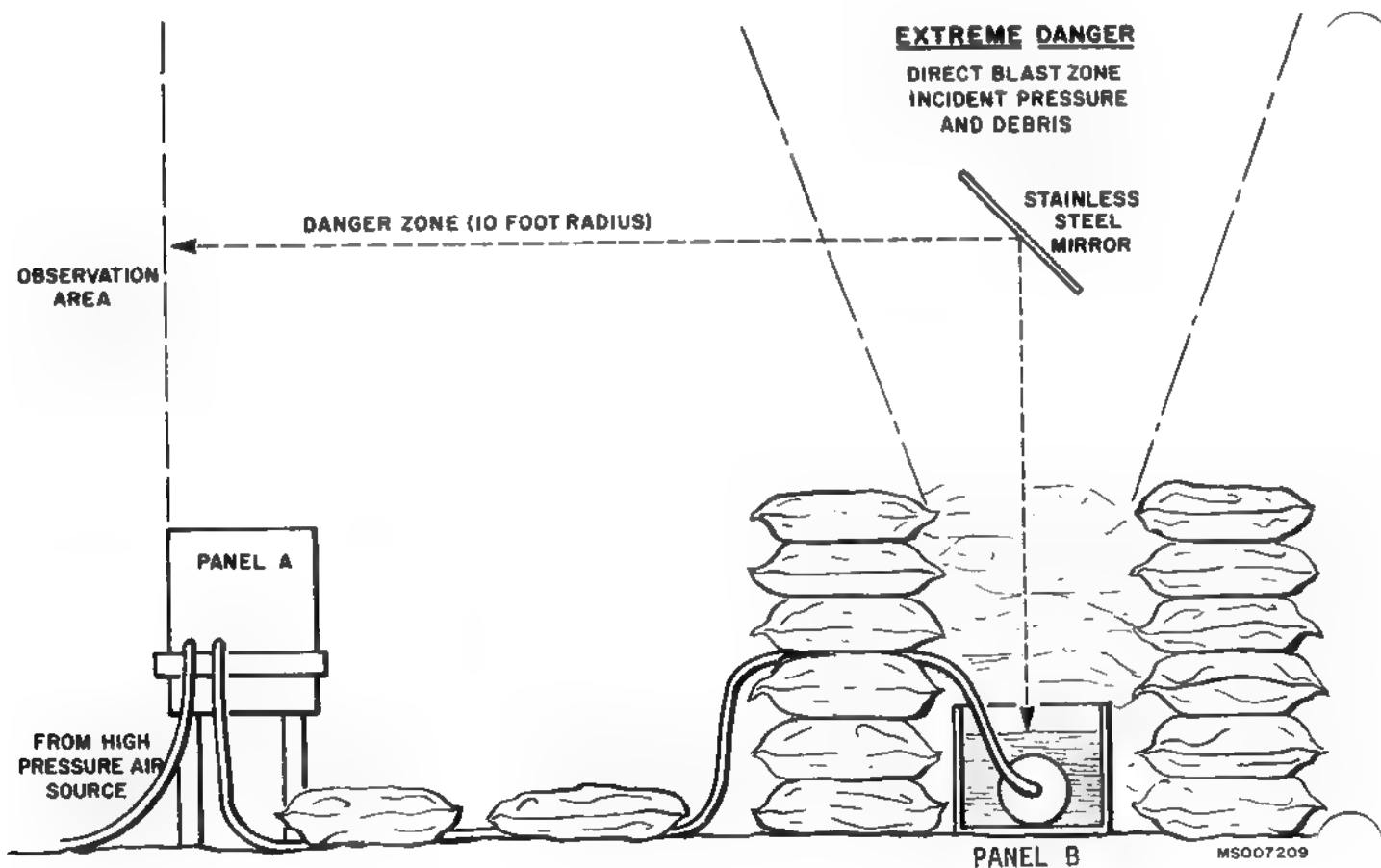


Figure 172.3. Air leak test layout.

Table XII.2. Air Leak Test

Step	Panel	Control	Operation	Normal indication
1	A	3500 PSI SHUT-OFF	Open slowly until GAGE A indicates 3500 psi, then close.	There must be no internal or external leakage from the UUT.
2	B		Check surface of fluid in tank for signs of leakage. (Air bubbles).	
3	A	3500 PSI BLEED	Open to relieve all pressure.	

- (b) Disconnect the UUT from test equipment.
- (5) Preparation for final test—Part 2.

*Note.* It is not necessary to use the sand bag barricade during part 2 of the final test, because hydraulic pressure is used in

the oil leak test. The piston movement test uses only a nominal air pressure of about 10 psi and the UUT has already been subjected to an air pressure of 3500 psi during the air leak test.

- (a) Connect the test equipment to the UUT as indicated in figure 172.4.

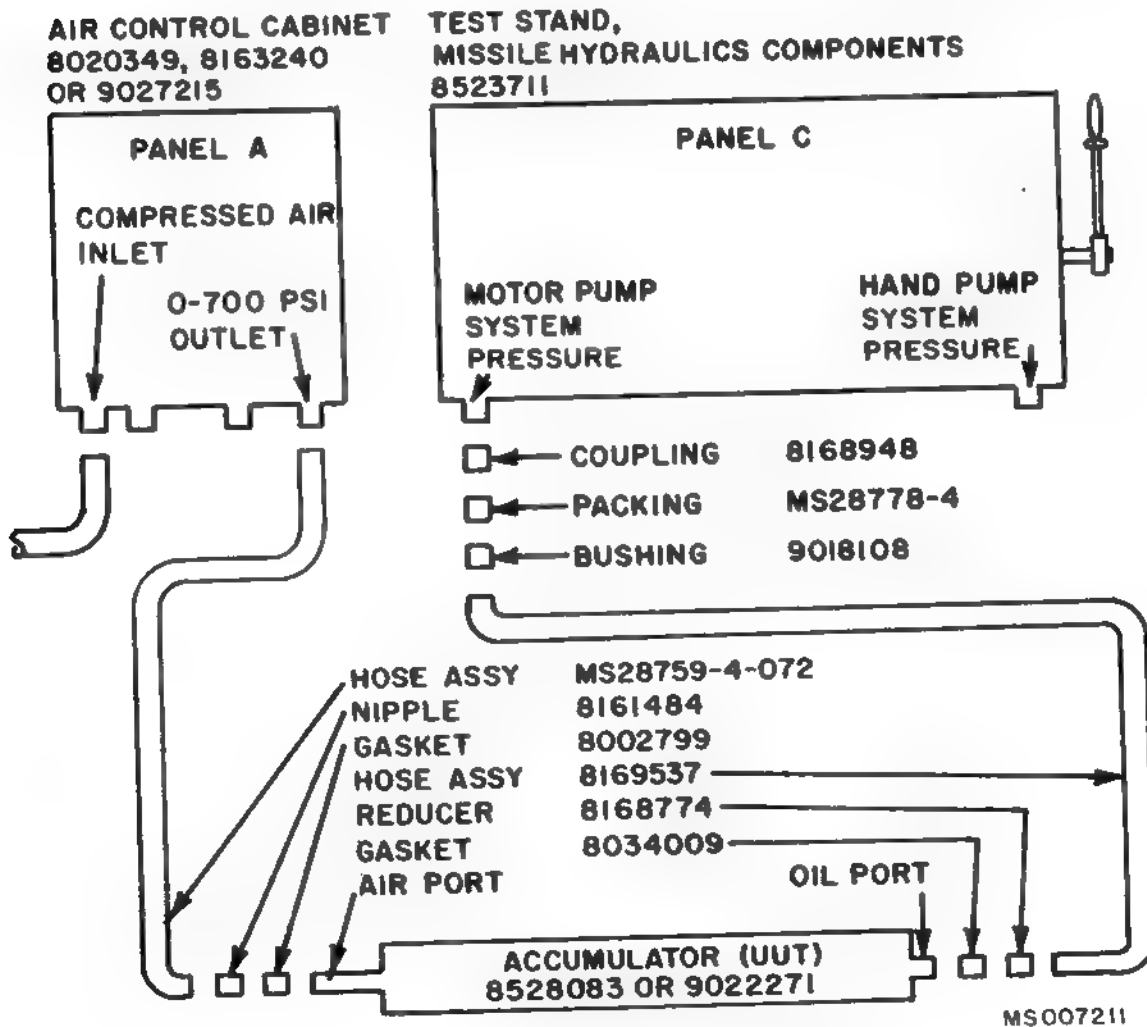


Figure 172.4. Oil leak and piston movement test diagram.

- (b) On panel C, open GAGE A SHUT-OFF.
- (c) On panel A, close 0-700 PSI BLEED, open GAGE B SHUT-OFF, and open 0-700 PSI SHUT-OFF.
- (d) All other controls will be in the

- closed (OFF) position.
- (6) Final inspection standard—Part 2.
- (a) Position the controls and perform the oil leak and piston movement test as prescribed in table XII.3. The indications must be as given.

Table XII.3. Oil Leak and Piston Movement Test

Step	Panel	Control	Operation	Normal indication
1	C	PUMP MOTOR	Press START.	There must be no leakage from UUT.
2	C	PRESSURE TO MANIFOLD-MANIFOLD TO RESERVOIR	Set to PRESSURE TO MANIFOLD to fill oil side of UUT.	
3	C	PRESSURE TO MANIFOLD-MANIFOLD TO RESERVOIR	Set to MANIFOLD TO RESERVOIR.	
4	C	PUMP MOTOR	Press STOP.	
5			Disconnect oil test hose from the PRESSURE port on panel C and lay the end of the hose in the sink.	
6			Connect air test hose . 69283 to 0-700 PSI OUTLET of panel A and to air inlet of UUT.	
7	A	0-700 PSI REGULATOR	Adjust slowly cw to apply 10 $\pm$ 5 psi to air end of UUT until oil flow from oil hose is free of air bubbles.	
8	A	0-700 PSI REGULATOR	Adjust fully ccw.	
9			Disconnect air test hose from the air inlet of UUT.	
10			Reconnect oil test hose to a PRESSURE port on the MOTOR PUMP SYSTEM side of panel C.	
11			Repeat steps 1 through 4 to refill oil side of UUT.	
12			Disconnect the oil test hose from the PRESSURE port on the MOTOR PUMP SYSTEM side of panel C and connect the hose to a PRESSURE port on the HAND PUMP SYSTEM side.	
13	C	GAGE D SHUT-OFF	Open.	
14	C	BLEED	Close.	
15	C	PRESSURE SHUT-OFF	Open.	

Table XII.3 Oil Leak and Piston Movement Test - Continued

Step	Panel	Control	Operation	Normal indication
16	C	HAND PUMP	Actuate until GAGE D indicates 4500 psi.	There must be no internal oil leakage in air side of UUT. There must be no external leakage.
17	C	PRESSURE SHUT-OFF	Close.	
18	C	PRESSURE SHUT-OFF	Open.	
19	C	BLEED	Open.	
20			Disconnect oil test hose from the PRESSURE port on panel C and lay the end of the hose in the sink.	
21			Connect air test hose to air inlet of UUT.	Piston in UUT must move freely as indicated by uniform flow of oil from oil hose.
22	A	0-700 PSI REGULATOR	Adjust slowly cw to apply 10 $\pm$ 5 psi to air end of UUT.	
23	A	0-700 PSI REGULATOR	Adjust fully ccw.	
24			Reconnect oil test hose to a PRESSURE port on the MOTOR PUMP SYSTEM side of panel C.	
25			Disconnect air test hose from air inlet of UUT.	Air flow from air inlet of UUT must be uniform.
26	C	PUMP MOTOR	Press START.	
27	C	PRESSURE TO MANIFOLD-MANIFOLD TO RESERVOIR	Set to PRESSURE TO MANIFOLD to fill oil side of UUT.	
28	C	PRESSURE TO MANIFOLD-MANIFOLD TO RESERVOIR	Set to MANIFOLD TO RESERVOIR.	
29	C	PUMP MOTOR	Press STOP.	
30			Disconnect oil test hose from oil inlet of UUT.	
31			Connect air test hose to air inlet of UUT.	
32	A	0-700 PSI REGULATOR	Adjust slowly cw to apply 10 $\pm$ 5 psi to air side of UUT to drain oil from oil side of UUT.	
33	A	0-700 PSI REGULATOR	Adjust fully ccw.	
34	A	0-700 PSI SHUT-OFF	Close.	
35	A	0-700 PSI BLEED	Open.	
36	A	GAGE B SHUT-OFF	Close.	

(b) Disconnect the UUT from the test equipment, drain any remaining oil, and plug the ports.

**f. Installation.**

- (1) Install the equilibrator accumulator group (fig. 170).
- (2) Connect the tube assembly to the front end of the accumulator group and torque the coupling nut to 150 pound-inches.
- (3) Remove the plug from the hydraulic port of the accumulator group.
- (4) Connect the pipe assembly to the rear end of the accumulator group and torque the coupling nut to 1000 pound-inches.

*Note.* Steps (5) through (7) below are performed to prevent the piston within the accumulator group from sticking and bottoming hard when the full 600 psi precharge is admitted into the accumulator group.

- (5) Close the EQUILIBRATOR SYSTEM BY-PASS valve, (fig. 60) and keep it closed during next step.
- (6) Precharge the equilibrator accumulator to 125  $\pm$  25 psi as described in paragraph 40.
- (7) Open the EQUILIBRATOR SYSTEM BY-PASS valve. This will bottom the piston of the accumulator group slowly.
- (8) Fully precharge the equilibrator accumulator as described in paragraph 40.
- (9) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (10) Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve.
- (11) Perform the launcher hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.

**84. Cam-Operated Valve Group**

*Note.* The key numbers shown in parentheses in *a* through *d* below refer to figure 173.

**a. Removal.**

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Disconnect two tube assemblies (1 and 2).
- (4) Remove cam-operated valve group (6) and cap tube assemblies (1 and 2).

**b. Disassembly.**

- (1) Disassemble valve group (6).
- (2) Disassemble cam-operated valve assembly (fig. 174).

**c. Assembly.**

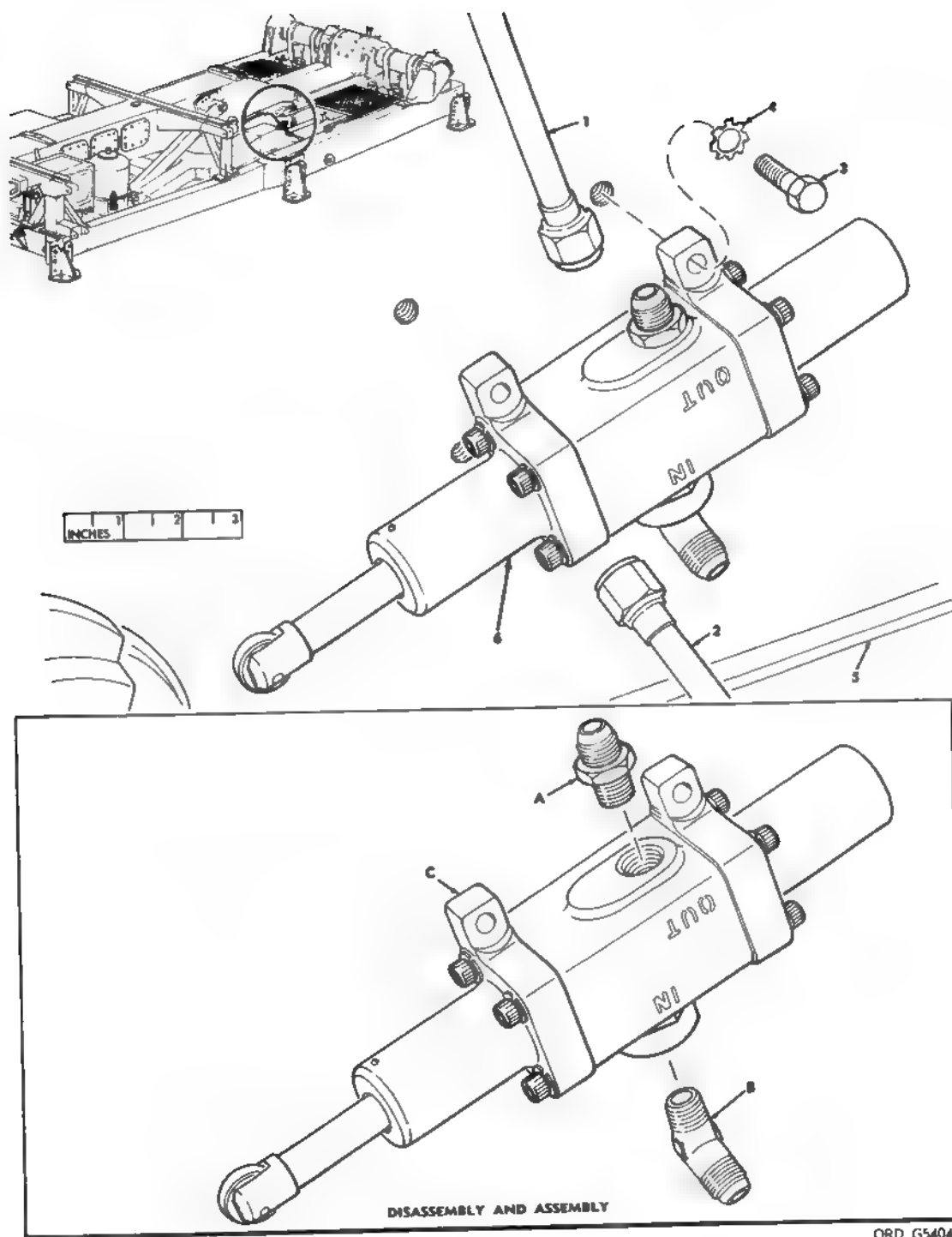
- (1) Assemble cam-operated valve assembly.
- (2) Assemble valve group (6).

**d. Installation.**

- (1) Install valve group (6).
- (2) Connect the two tube assemblies (1 and 2) and torque coupling nuts to 500 pound-inches.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

**85. Plug Cock Group****a. Removal.**

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Depressurize the compressed gas cylinder as described in paragraph 41d.
- (4) Disconnect the three tube assemblies (fig. 175).
- (5) Remove plug cock group and cap tube assemblies.

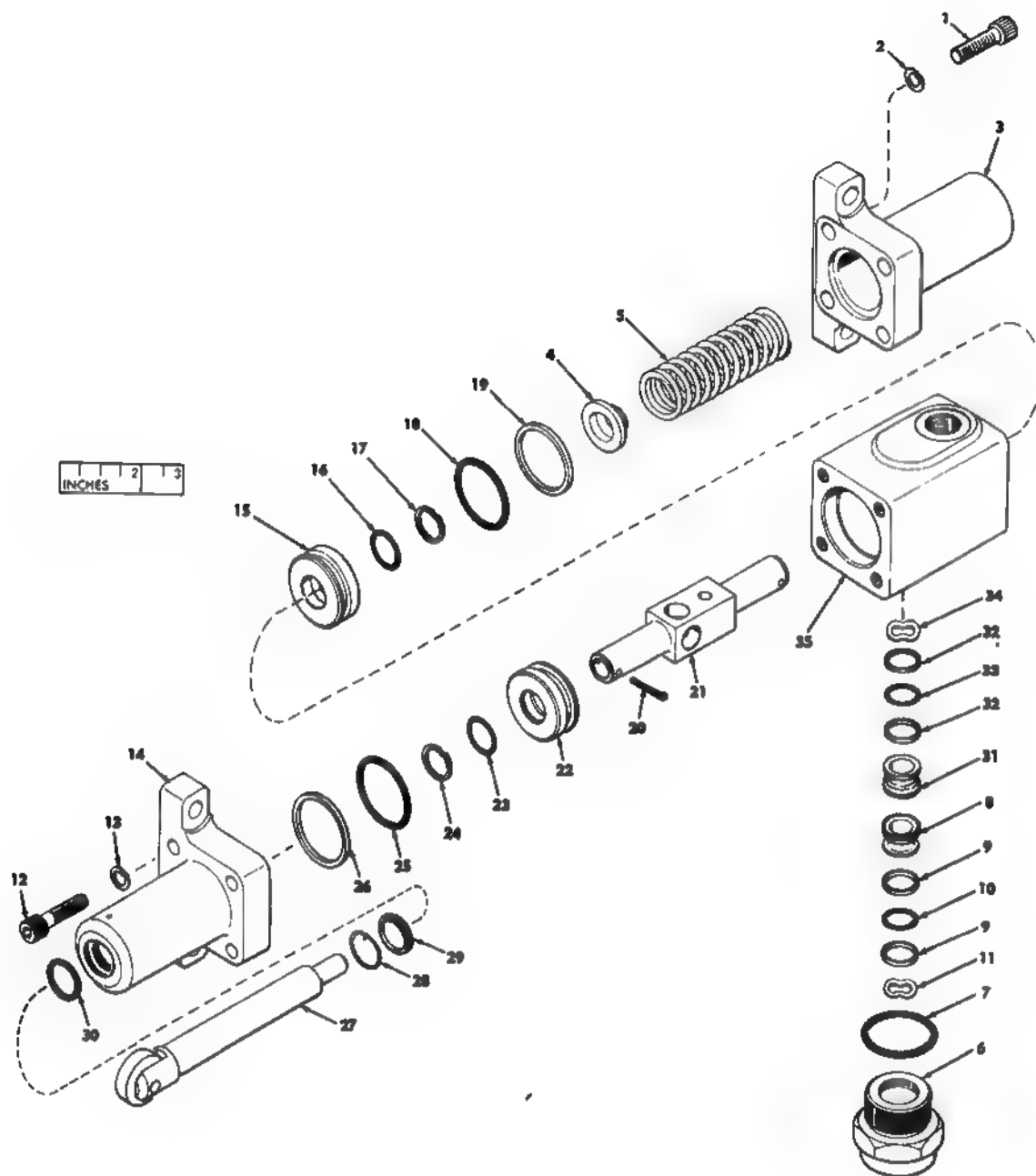


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- 1—Tube assembly—9032296
- 2—Tube assembly—9032293
- 3—3/8-16 x 1 hexagon-head capcrew (4)
- 4—3/8-inch external-teeth lockwasher (4)
- 5—Launcher base assembly

- 6—Cam-operated valve group
- A—Adapter
- B—Tube elbow
- C—Cam-operated valve assembly

Figure 173. Cam-operated valve group — removal and installation.



ORD G61641

Figure 174. Cam-operated valve assembly - disassembly and assembly.

- |                                      |   |
|--------------------------------------|---|
| 1—Socket-head capcrew (4)            | 19—Nonmetallic washer 89326-A25201-24     |
| 2—Lockwasher (4)                     | 20—3/32 x 1 cotter pin                    |
| 3—Valve spring housing               | 21—Slide                                  |
| 4—Shouldered and recessed washer     | 22—Gasket                                 |
| 5—Helical compression spring         | 23—Preformed packing 89326-A25101-12      |
| 6—Packing nut                        | 24—Preformed packing 8526860              |
| 7—Preformed packing 89326-PRP6290-16 | 25—Preformed packing 8526893              |
| 8—Valve shear seal                   | 26—Nonmetallic washer 89326-A25201-24 (2) |
| 9—Nonmetallic washer 89326-A25201-10 | 27—Extension shaft                        |
| 10—Preformed packing 8486460         | 28—Retaining ring                         |
| 11—Spring tension washer             | 29—Wiper ring                             |
| 12—Socket-head capcrew (4)           | 30—Packing material                       |
| 13—Lockwasher (4)                    | 31—Valve shear seal                       |
| 14—End extension bracket             | 32—Nonmetallic washer 89326-A25201-10 (2) |
| 15—Gasket                            | 33—Preformed packing—8486460              |
| 16—Preformed packing 89326-A25101-12 | 34—Spring tension washer                  |
| 17—Preformed packing 8526860         | 35—Valve body                             |
| 18—Preformed packing 8526893         |   |

*Figure 174. Cam-operated valve assembly—disassembly and assembly—legend.*

**b. Disassembly.**

- (1) Disassemble plug cock group.
- (2) Disassemble plug cock assembly (fig. 176).

**c. Assembly.**

- (1) Assemble plug cock assembly.

- (2) Assemble plug cock group (fig. 175).

**d. Installation.**

- (1) Install the plug cock group.
- (2) Connect the three tube assemblies to plug cock group. Torque coupling nut



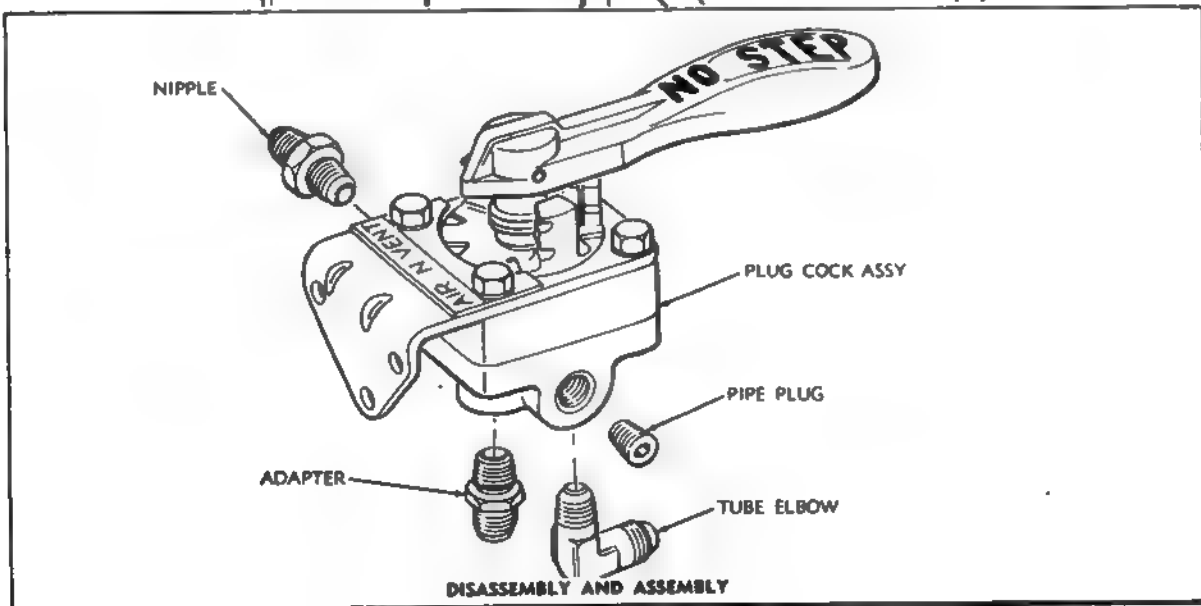
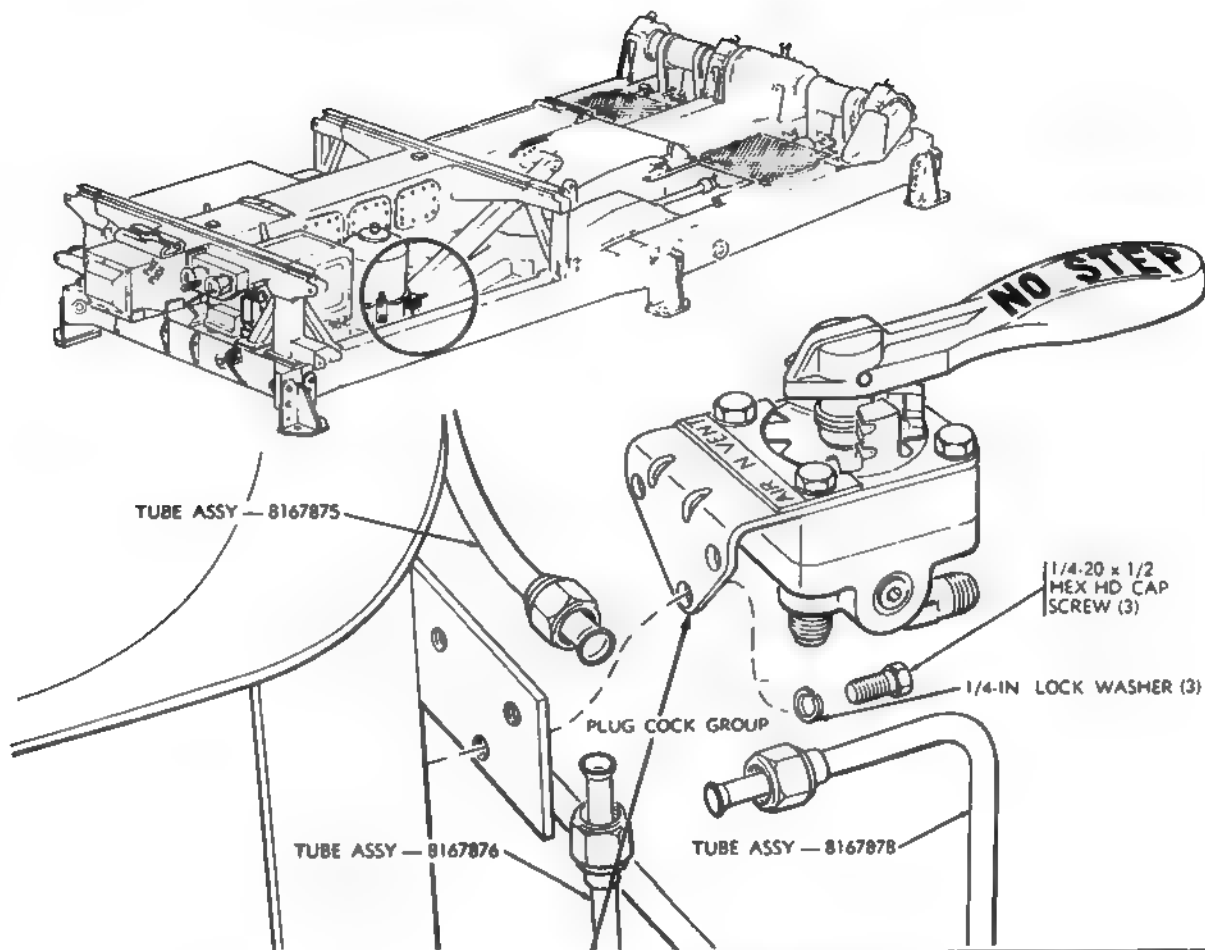
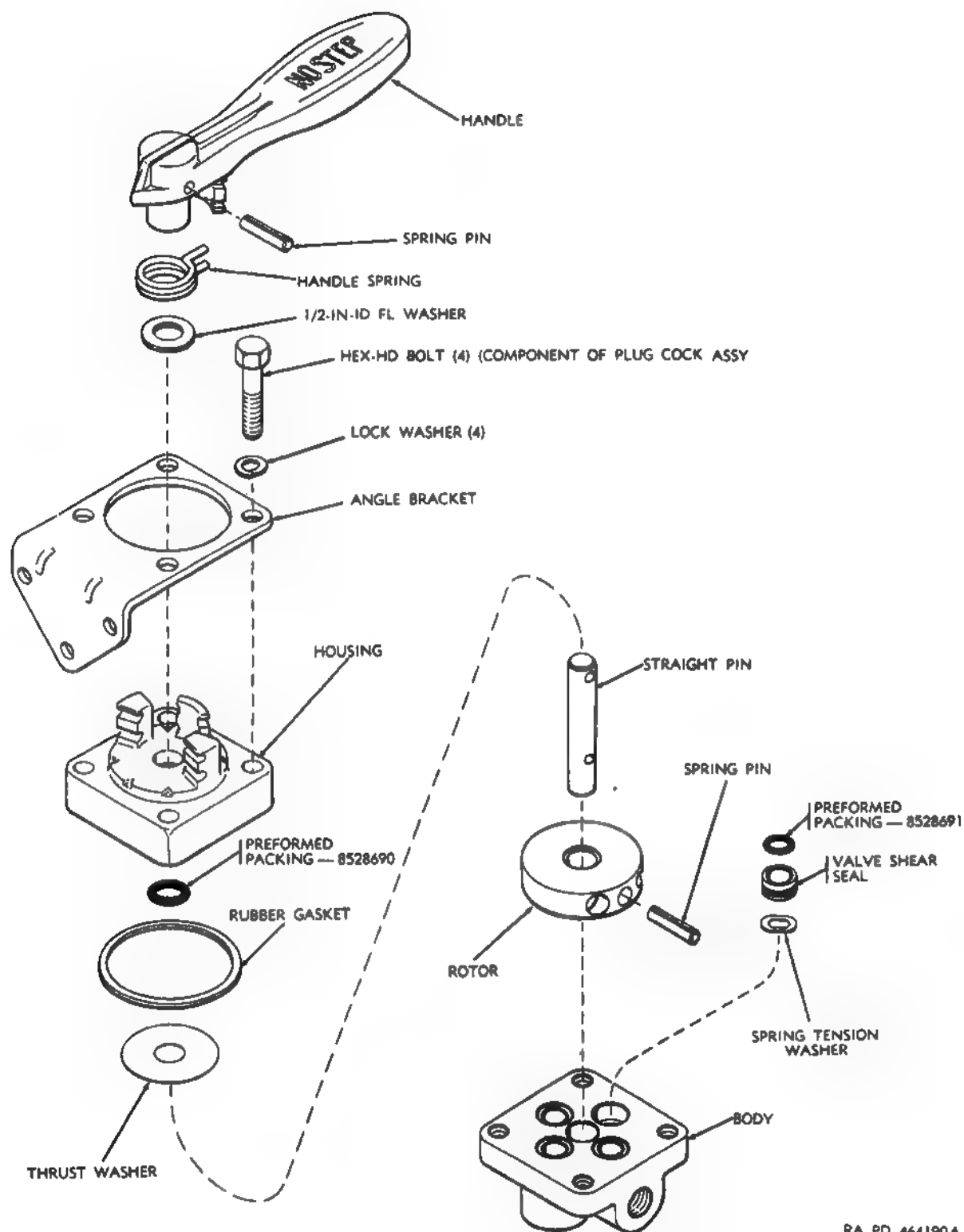


Figure 175. Plug cock group—removal and installation.

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RA PD 464190A

Figure 176. Plug cock assembly—disassembly and assembly.

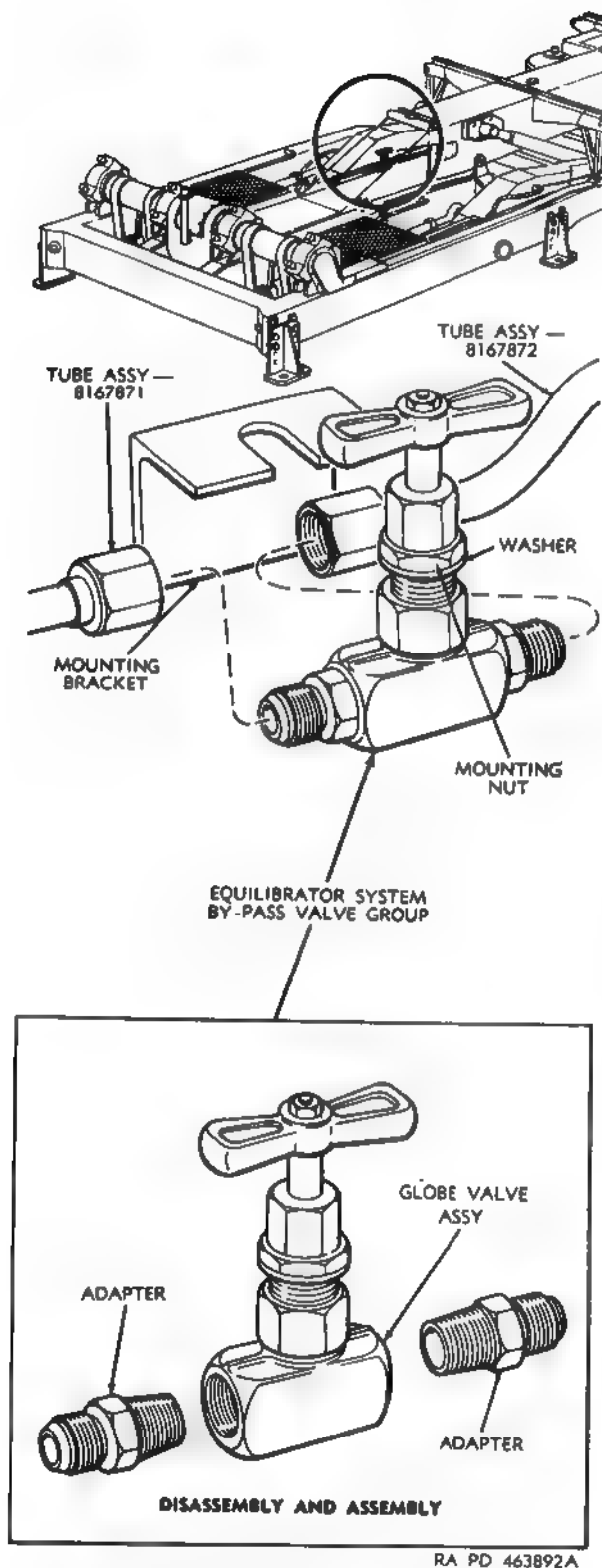


Figure 177. EQUILIBRATOR SYSTEM BY-PASS valve group—removal and installation.

of tube assembly-8167875 to 300 pound-inches and the other two coupling nuts to 150 pound-inches.

- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (4) Precharge the compressed gas cylinder as described in paragraph 40.
- (5) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

## 86. EQUILIBRATOR SYSTEM BY-PASS Valve Group

### a. Removal.

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Disconnect the two tube assemblies (fig. 177).
- (4) Remove EQUILIBRATOR SYSTEM BY-PASS valve group from mounting bracket; cap two tube assemblies.

### b. Disassembly.

- (1) Disassemble valve group.
- (2) Disassemble globe valve assembly (fig. 147).

### c. Assembly.

- (1) Assemble globe valve assembly.
- (2) Assemble valve group (fig. 177).

### d. Installation.

- (1) Position valve group on mounting bracket and install with mounting nut.
- (2) Connect the two tube assemblies to the valve group and torque coupling nuts to 150 pound-inches.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

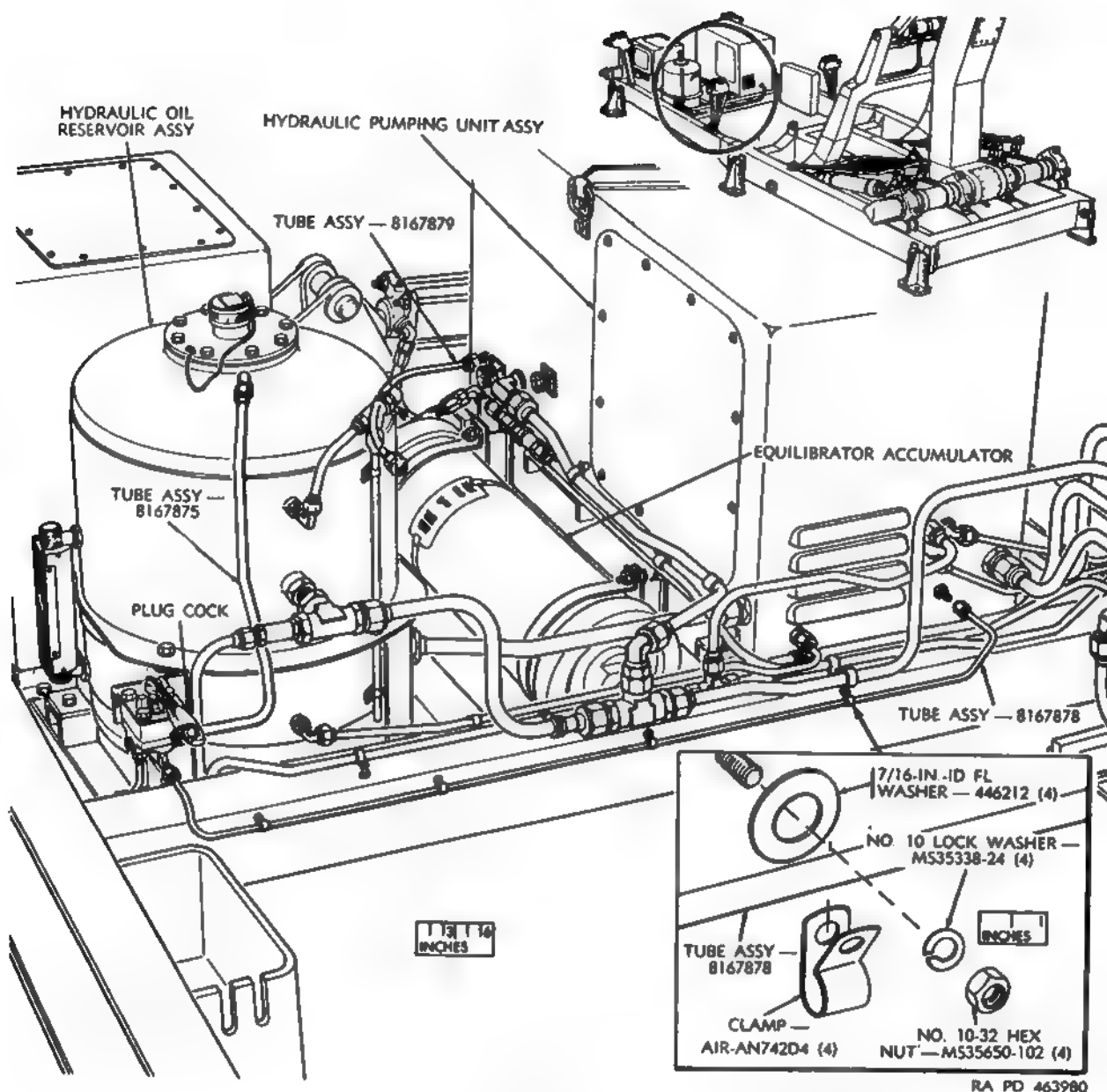


Figure 178. Precharge system hydraulic network — removal and installation.

- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

### 87. Precharge System Hydraulic Network

The precharge system hydraulic network consists of three tube assemblies (fig. 178) and clamps. Tube assembly—8167879 connects the hydraulic pumping unit assembly to the equi-

librator accumulator. Tube assembly—8167878 connects the hydraulic pumping unit assembly to the plug cock. Tube assembly—8167875 connects the plug cock to the hydraulic oil reservoir assembly.

#### a. Tube Assembly—8167875.

##### (1) Removal.

- (a) Open the EQUILIBRATOR SYS-

TEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

- (c) Remove the tube assembly (fig. 178) and cap the open lines.

(2) *Installation.*

- (a) Install the tube assembly and torque the coupling nuts to 300 pound-inches.
- (b) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.
- (c) Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve.

b. *Tube Assembly 8167878.*

(1) *Removal.*

- (a) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.
- (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (c) Depressurize the compressed gas cylinder as described in paragraph 41.
- (d) Remove the clamps (fig. 178) and the tube assembly, and cap the open lines.

(2) *Installation.*

- (a) Install the tube assembly and clamps; torque the coupling nuts to 150 pound-inches.
- (b) Pressurize the compressed gas cylinder as described in paragraph 40.
- (c) Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve.
- (d) Lower the launcher erecting beam to the down-and-locked position as described TM 9-1440-250-20/1.

c. *Tube Assembly 8167879.*

(1) *Removal.*

- (a) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.
- (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (c) Depressurize the equilibrator accumulator as described in paragraph 41d.
- (d) Remove the tube assembly (fig. 178) and cap the open lines.

(2) *Installation.*

- (a) Install the tube assembly and torque the coupling nuts to 150 pound-inches.
- (b) Pressurize the equilibrator accumulator as described in paragraph 40.
- (c) Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve.
- (d) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.

## 88. Axial Pistons Pump System Hydraulic Network

The axial pistons pump system hydraulic network consists of four tube assemblies (fig. 179), hydraulic fittings, and clamps. Tube assembly 8167919 supplies hydraulic fluid to the hydraulic pumping unit assembly from the hydraulic oil reservoir assembly. Tube assemblies 8167881 and 8167877 carry return fluid from the pumping unit assembly to the reservoir assembly. Tube assembly 9031118 is the case drain return line (fig. 8) connecting the pumping unit assembly to the axial pistons pump.

a. *Removal.*

- (1) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.
- (2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

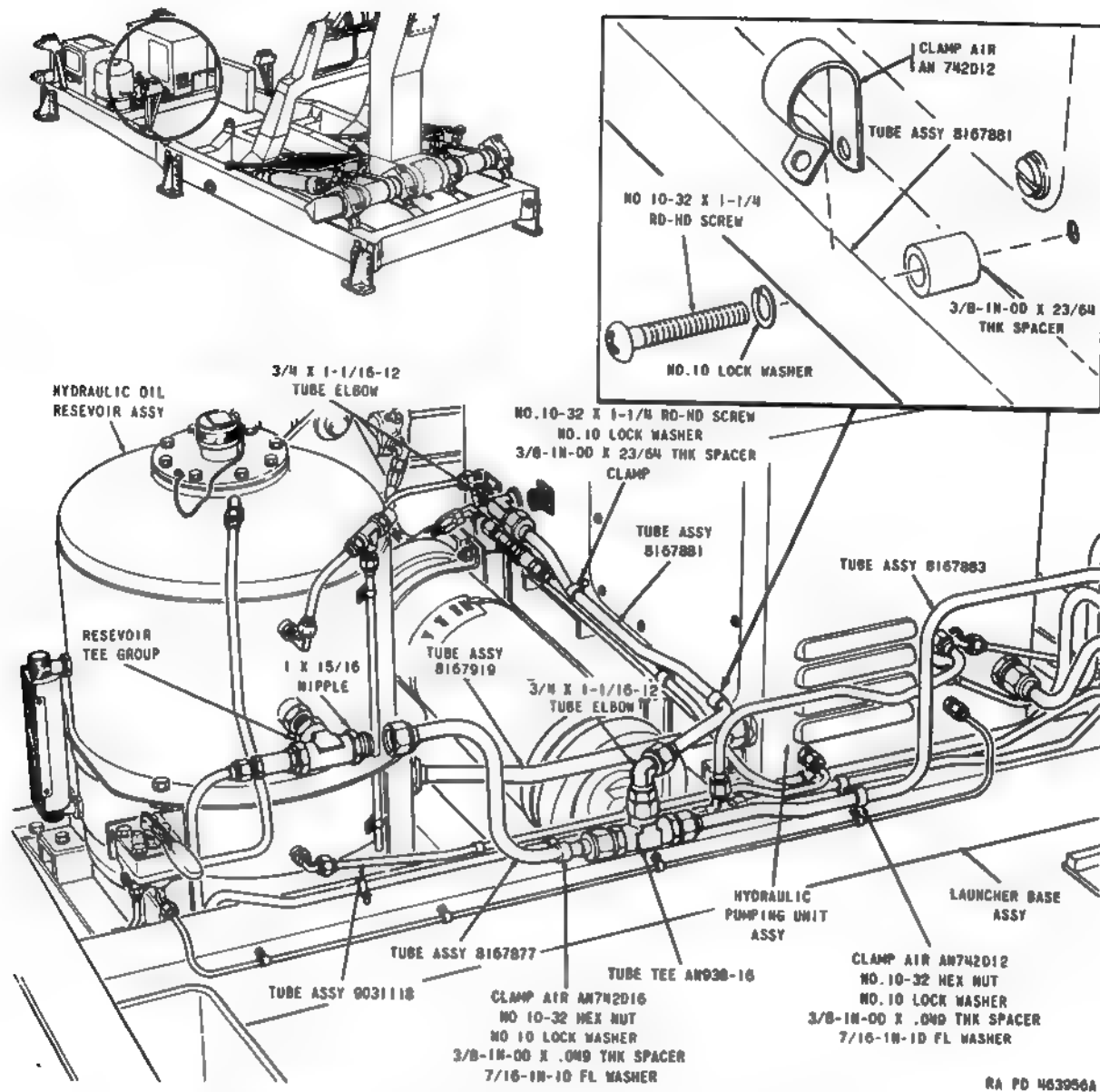


Figure 179. Axial pistons pump system hydraulic network — removal and installation.

- (3) Drain the hydraulic oil reservoir assembly by removing the drain plug as described in paragraph 82a.
- (4) Remove the tube assemblies (fig. 179), tube elbows, tube tee, and clamps; cap all open lines.

**b. Installation.**

- (1) Install the tube assemblies, tube tee,

tube elbows, and clamps. Torque the coupling nuts to the values specified below:

Tube assembly	Torque value (pound-inches)
8167919	1450
8167881	1000
8167877	1450
9031118	800

- (2) Install the drain cap on the nipple (4, fig. 161). Torque the cap to 270 pound-inches.
- (3) Fill the hydraulic oil reservoir assembly with hydraulic fluid to the FULL mark as described in TM 9-1440-250-20/1.
- (4) Pressurize the hydraulic oil reservoir (fig. 60) to 18 to 22 psi by turning the handle of the plug cock to the AIR position.
- (5) Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve.
- (6) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.

### 89. Locking Wedge System Hydraulic Network

The locking wedge system hydraulic network consists of the tube assemblies, clamps, bleeder valves, and fittings necessary to provide hydraulic pressure and return lines for the operation of the locking wedges (fig. 41), front and rear, inside the launcher erecting beam.

#### *a. Removal of the Tube Assemblies, Fittings, and Clamps between the Two Locking Wedges.*

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Remove the three plates (view A, fig. 180) and the front end cover.
- (3.1) Remove the three gasket cover assemblies (fig. 83).
- (4) Remove the beam center cover (fig. 82).
- (5) Remove the clamps (fig. 181) from the tube assemblies to be replaced.
- (6) Remove the components to be replaced; cap all open lines.

#### *b. Installation of the Tube Assemblies, Fittings, and Clamps between the Two Locking Wedges.*

- (1) Install the components as shown in figure 181; torque the coupling nuts to 300 pound-inches.

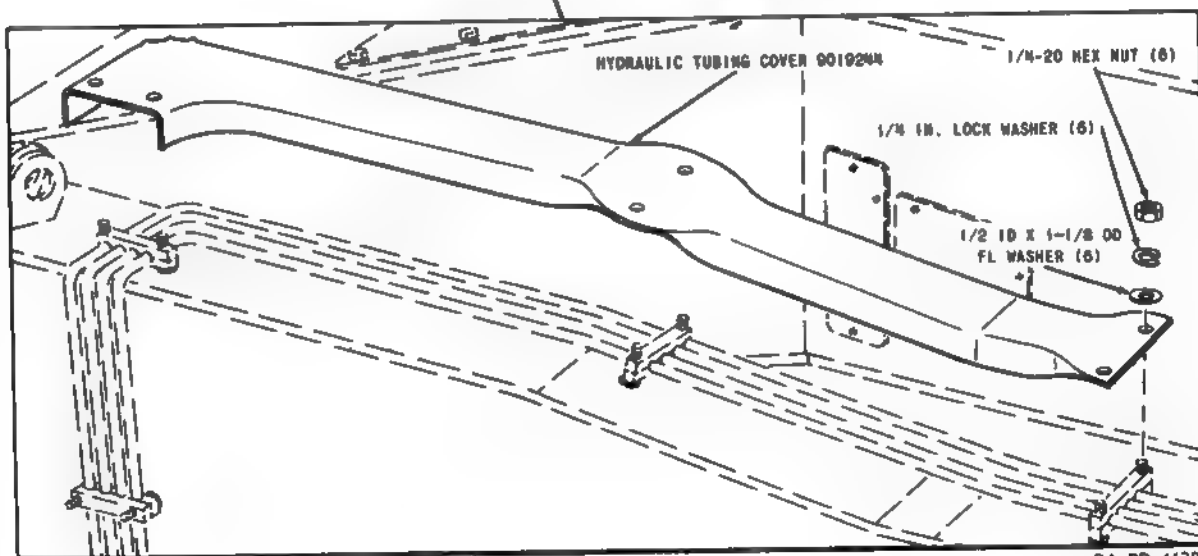
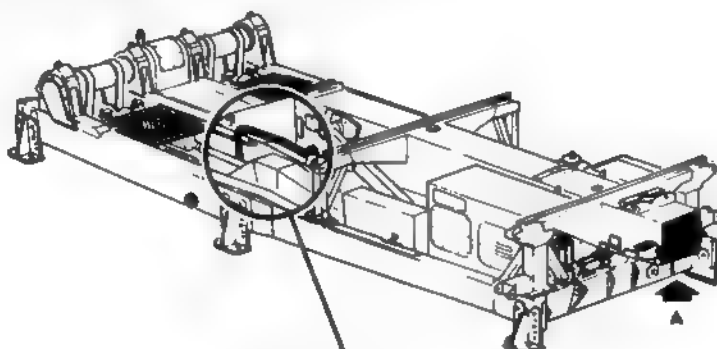
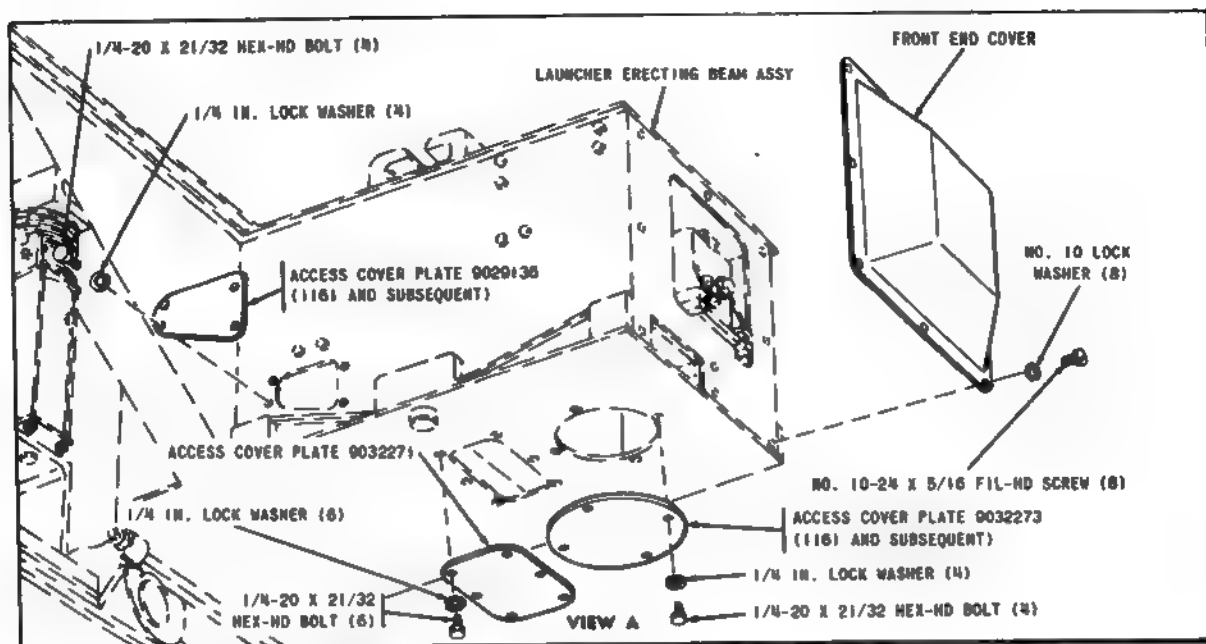
*Note.* If the HYDRAULIC RESERVOIR PRESSURE gage (fig. 59) indicates below 15 psi or the liquid sight indicator (fig. 17) on the hydraulic oil reservoir indicates below the halfway point during these procedures, the hydraulic oil reservoir must be serviced as described in TM 9-1440-250-20/1.

- (2) Pressurize the hydraulic oil reservoir (fig. 60) to 18 to 22 psi by turning the handle of the plug cock to the AIR position.

*Note.* The locking wedge hydraulic system network must be bled at the two bleeder valves (fig. 181) as described in (3) through (3.6) below.

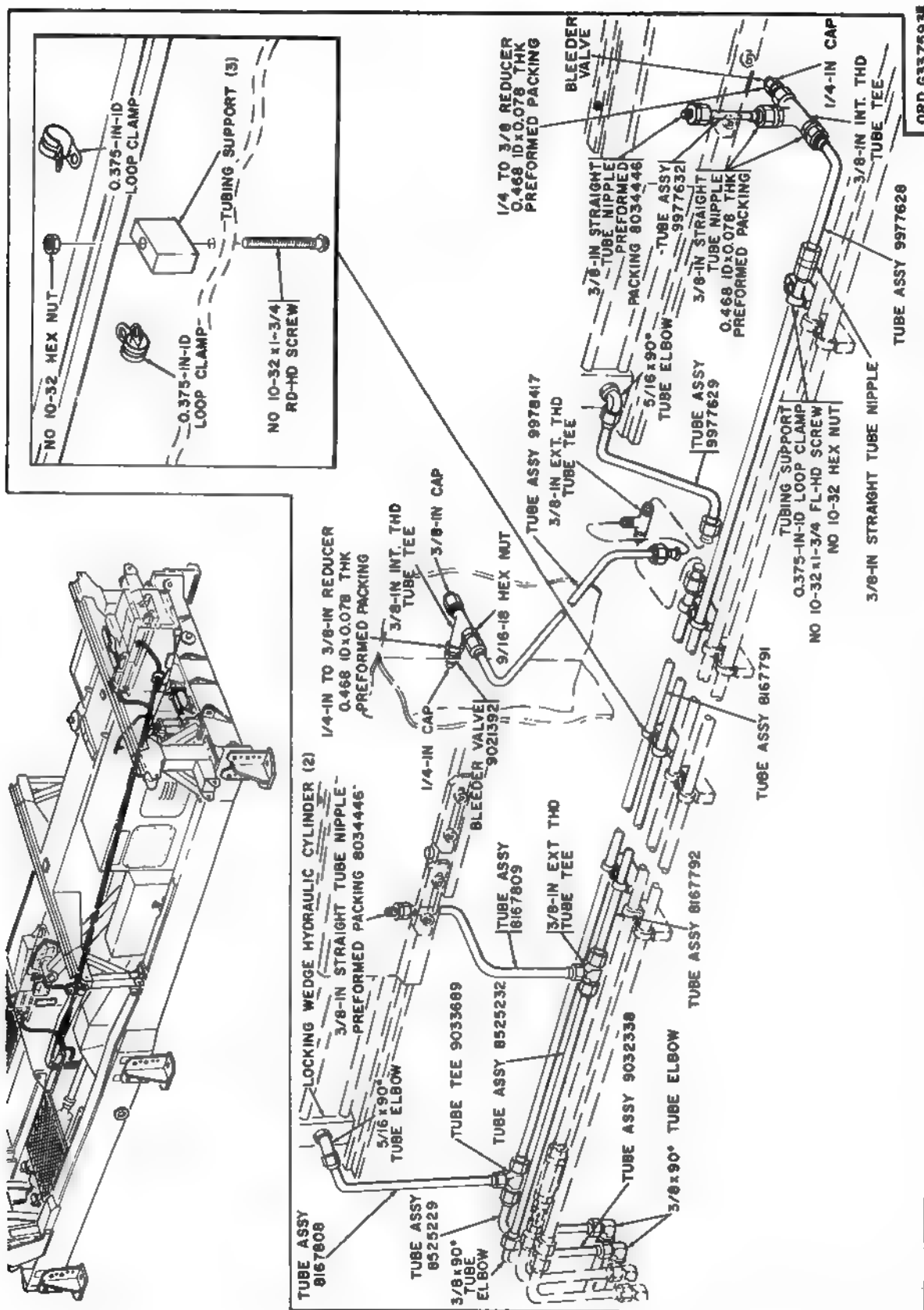
**Caution:** If at any time during these procedures the fluid level does not indicate on the liquid sight indicator (fig. 17), the hydraulic oil reservoir must be serviced as described in TM 9-1440-250-20/1, and the entire procedure must be repeated.

- (3) Check that AIR RESERVOIR PRESSURE gage (fig. 59) indicates between 600 and 2000 psi.
- (3.1) Remove the cap (fig. 181) from the bleeder valve located under the locking wedge hydraulic cylinder.
- (3.2) Bleed the air from the lines as described in TM 9-1440-250-20/1.
- (3.3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (3.4) Install the erecting beam support (fig. 57) under the launcher erecting beam as described in paragraph 36d(1) and TM 9-1440-250-20/1.
- (3.5) Remove the cap (fig. 181) from the bleeder valve located behind the locking wedge hydraulic cylinder.
- (3.6) Bleed the air from the lines as described in TM 9-1440-250-20/1.



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Figure 180. Hydraulic network access covers – removal and installation.



**Figure 181. Removal and installation of the locking wedge system hydraulic network.**

- (4) Install the three access cover plates and front end cover (view A, fig. 180), the beam center cover (fig. 82), and the three gasket cover assemblies (fig. 83).

*c. Removal of Tube Assemblies, Fittings, and Clamps between the Rear Locking Wedge and the Swivel Joints.*

- (1) Remove the beam center cover and erecting beam trunnion dust cover (fig. 82); remove the 3 access cover plates (fig. 180).
- (2) Raise the erecting beam to the up-and-locked position as outlined in paragraph 44.
- (3) Open the EQUILIBRATOR SYSTEM BY-PASS valve and SYSTEM BY-PASS valve (fig. 60).
- (4) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (5) Remove the clamps (fig. 182) from tube assemblies to be replaced.
- (6) Remove the tube elbows and tube assemblies (figs. 181 and 182) to be replaced; cap all open lines.

*d. Installation of Tube Assemblies, Fittings, and Clamps between Rear Locking Wedge and the Swivel Joints.*

- (1) Install the tube assemblies and clamps (figs. 181 and 182); torque the coupling nuts to 300 pound-inches.
- (2) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.
- (3) Pressurize the hydraulic oil reservoir to 18 to 22 psi by turning the handle of the plug cock to AIR position.
- (4) Lower the launcher erecting beam to the down-and-locked position as outlined in paragraph 44.
- (5) Bleed the air from the lines as outlined in TM 9-1440-250-20/1.
- (6) Install the beam center cover and erecting beam trunnion dust cover (fig. 82); install the three access cover plates (fig. 180).

*e. Removal of Support Trunnion, Tube Assemblies, Fittings, and Clamps Located in Main Trunnion.*

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve (fig. 60).
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Remove the erecting beam trunnion dust cover and the shield (fig. 82); remove the launcher base shield assembly and the hydraulic tubing rear cover (fig. 183).
- (4) Remove the three plates (view A, fig. 180) and the beam center cover (fig. 82).
- (5) Disconnect the four tube assemblies (fig. 184) inside the erecting beam from the four tube swivel joints. Cap all open lines.
- (6) Disconnect the four tube assemblies (fig. 186) on the right side of the launcher base assembly. Cap all open lines.
- (7) Disconnect the support trunnion group (fig. 184) from the hydraulic trunnion bracket.
- (8) Disconnect the support trunnion group (fig. 185) at the right side.
- (9) Remove those loop clamps (fig. 184) which are accessible and which attach the electrical power cable assembly to the trunnion group.
- (10) Loop clamps installed on the cable assembly that are not accessible must be removed as follows:
  - (a) Move the support trunnion group (fig. 185) out the right end of the main trunnion. The cable assembly (fig. 184) will not move, but the oversized loop clamps will slide over the cable assembly.
  - (b) Remove these loop clamps as they appear in the opening at the center of the main trunnion.
  - (c) Repeat steps (a) and (b) above until all the loop clamps have been removed.
- (11) Remove the support trunnion group (fig. 185).
- (12) Remove the support to be replaced.

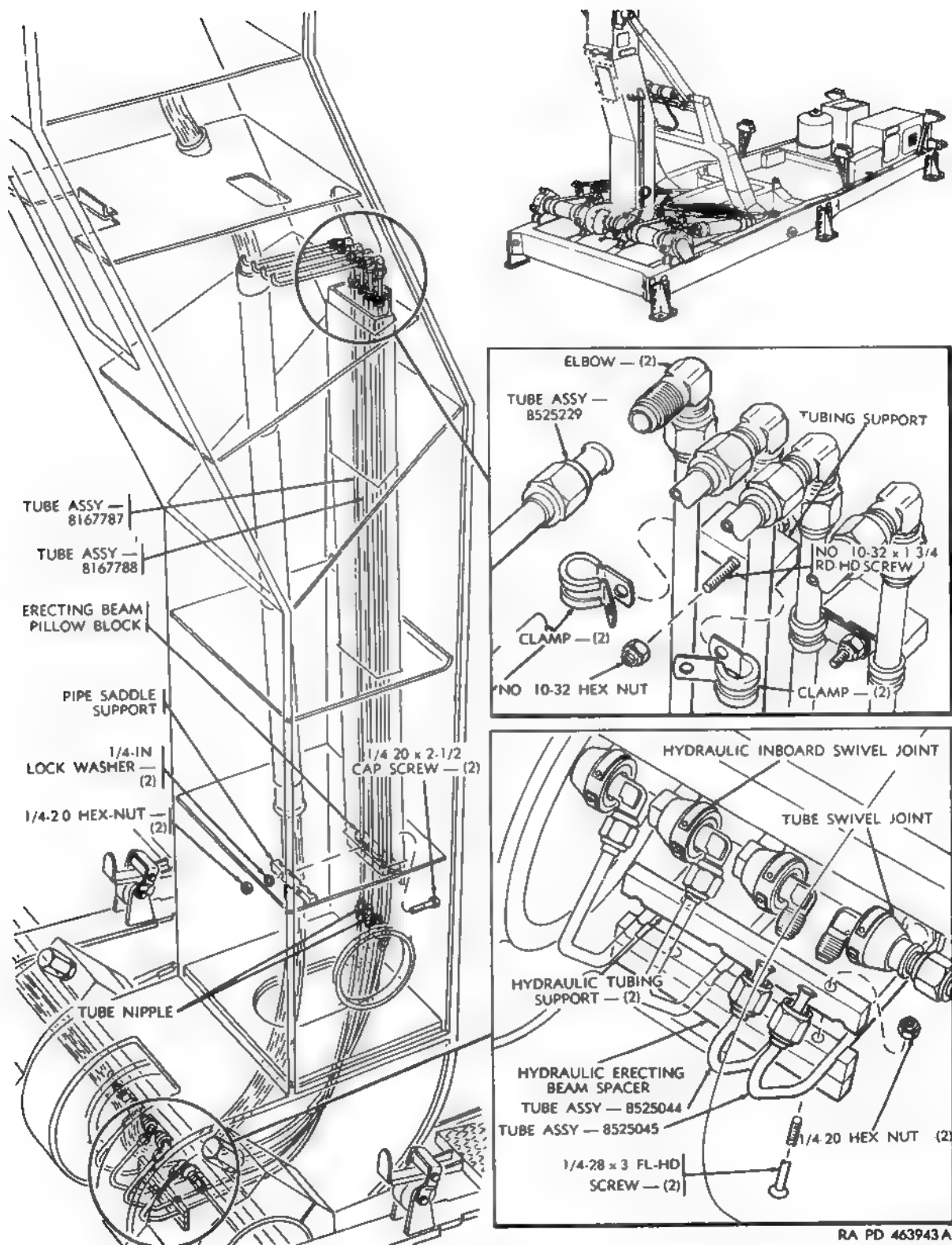


Figure 182. Locking wedge system hydraulic network—removal and installation—continued.

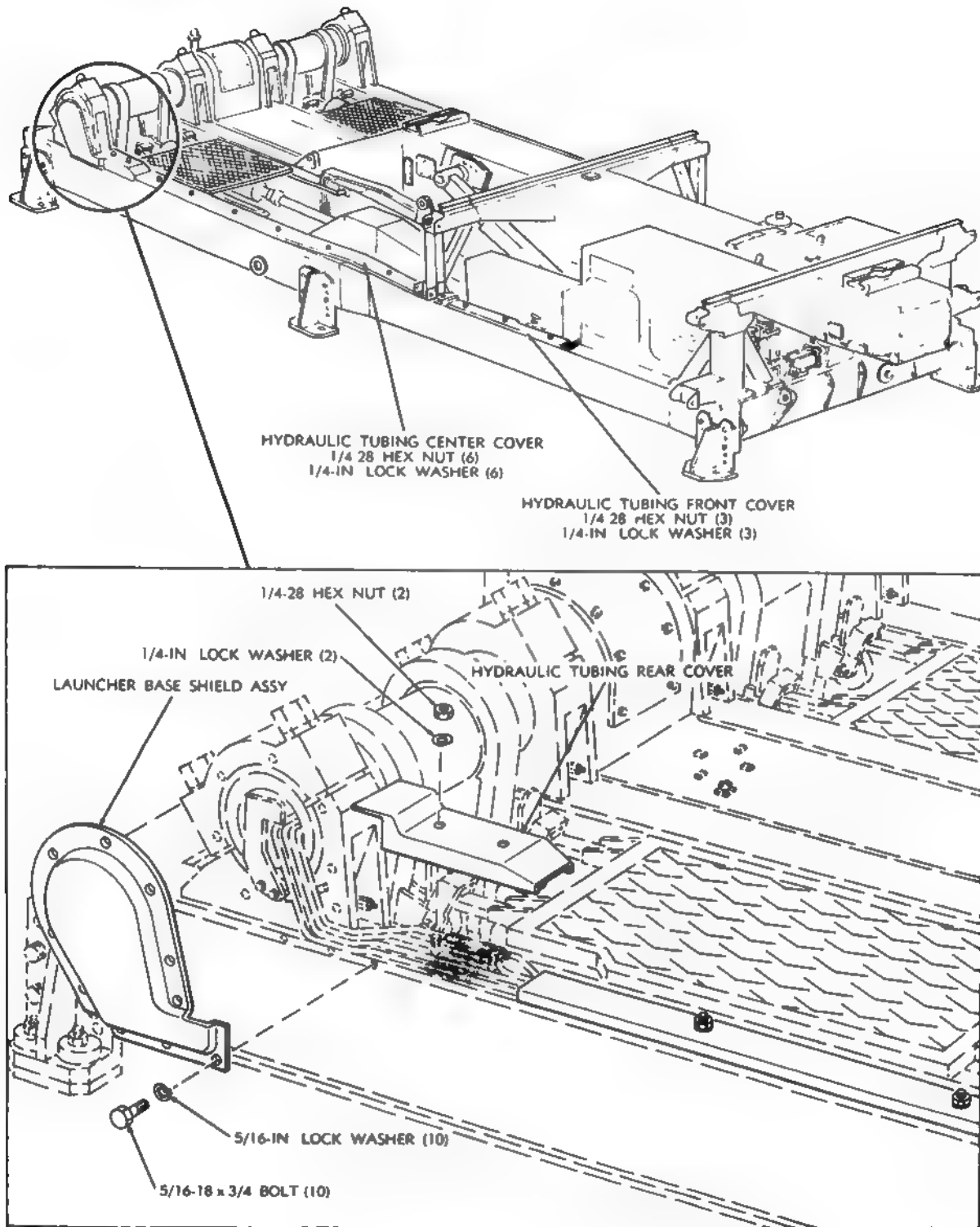


Figure 183. Launcher base hydraulic network access covers—  
removal and installation.

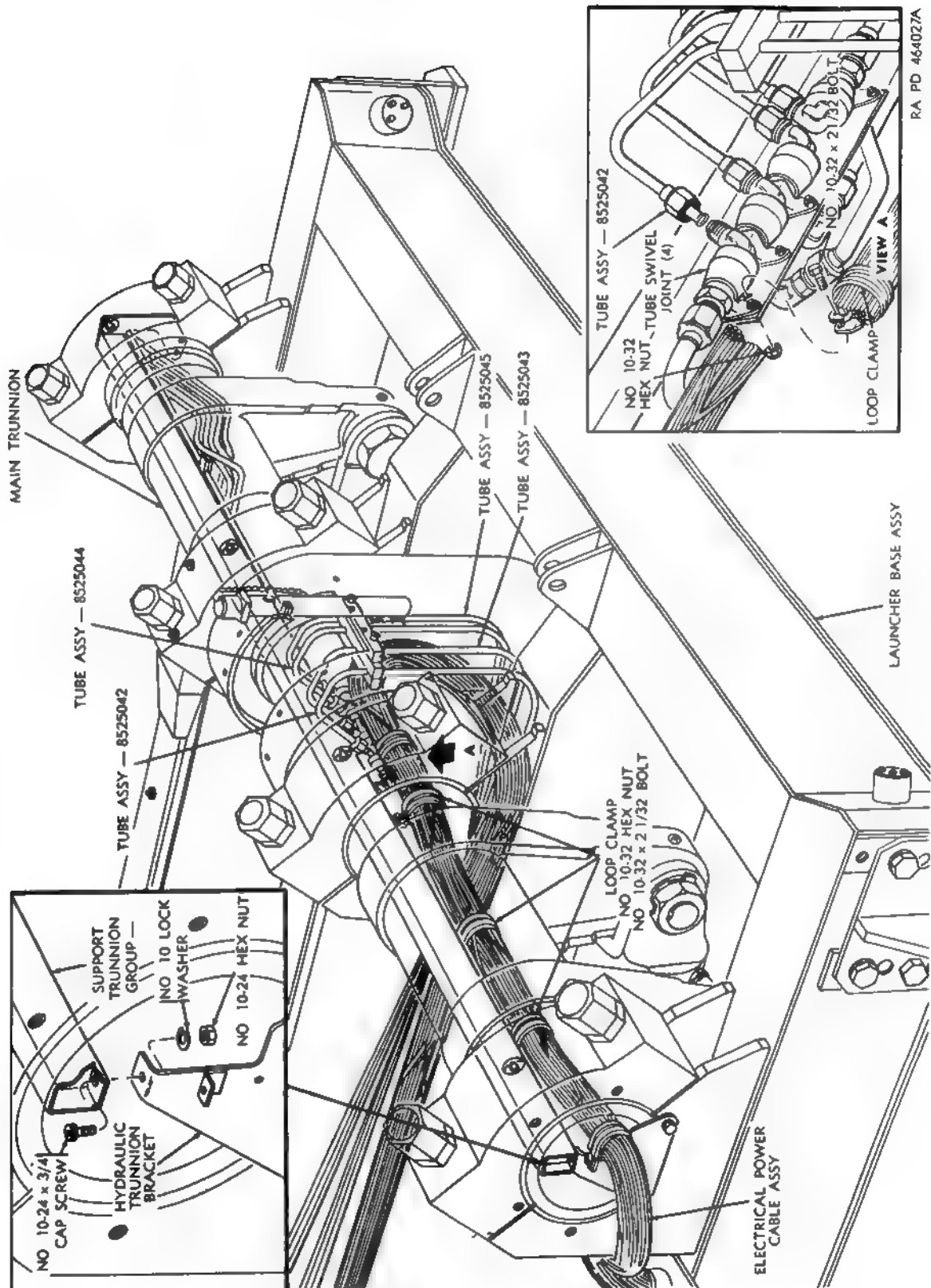


Figure 181. Locking wedge system hydraulic network—removal and installation.

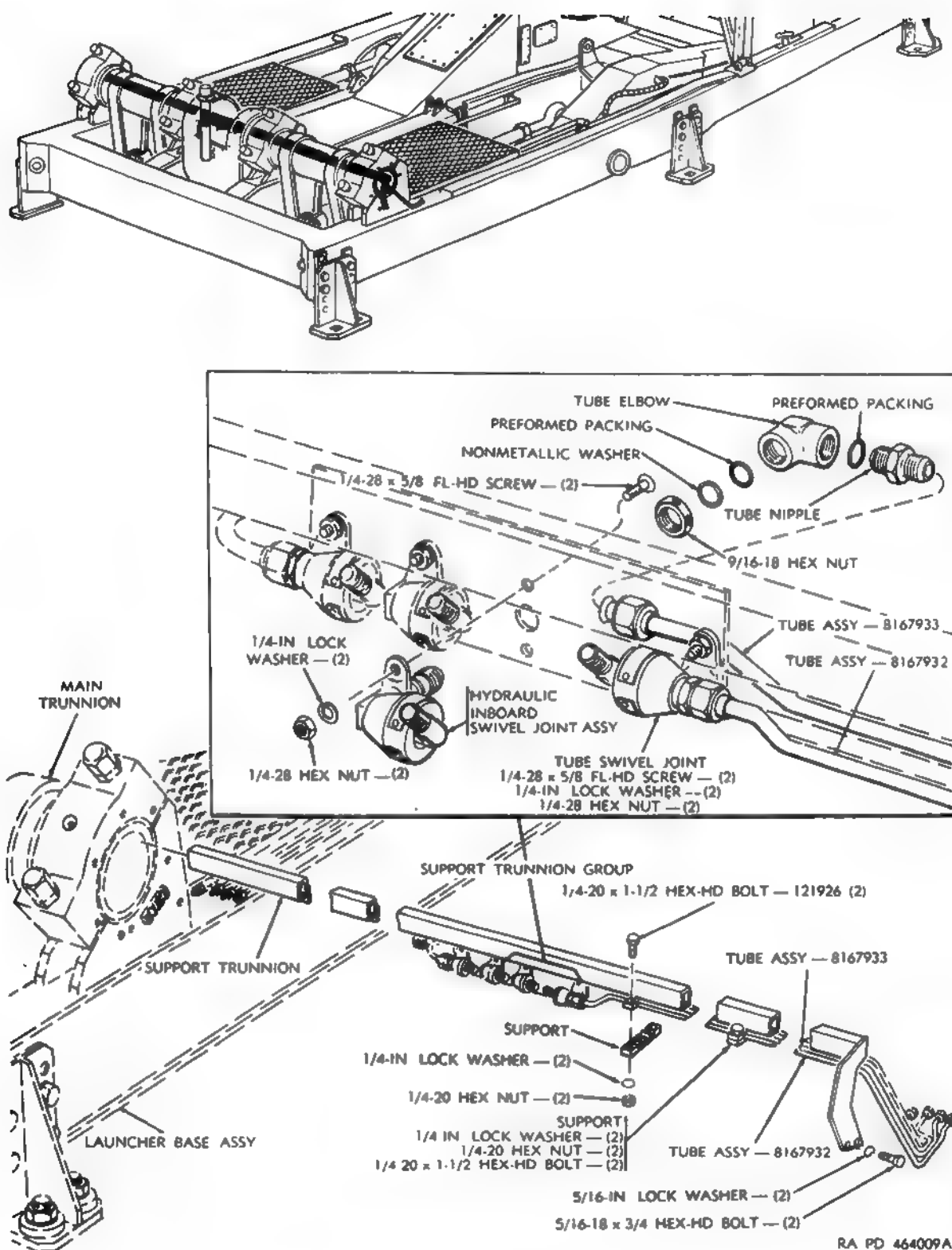


Figure 185. Locking wedge system hydraulic network—removal and installation—continued.

- (13) Remove tube assemblies to be replaced on support trunnion by disconnecting from swivel joint and removing two supports.
- (14) Remove tube nipple or tube elbow to be replaced.
- (15) Remove tube swivel joint assembly.
- (16) Remove hydraulic inboard swivel joint assembly.

*f. Installation of Support Trunnion, Tube Assemblies, Fittings, and Clamps Located in Main Trunnion.*

- (1) Install tube swivel joint assembly and hydraulic inboard swivel joint assembly as shown in fig. 185.
- (2) Connect tube assemblies to swivel joint assemblies (view A, fig. 184) and torque coupling nuts to 300 pound-inches.
- (3) Install two supports.
- (4) Install loop clamps (fig. 184) as described in (a) through (c) below.
  - (a) Slide support trunnion group (fig. 185) in main trunnion until first loop clamp (fig. 184) can be installed.
  - (b) Install loop clamp.
  - (c) Repeat (a) and (b) above until all loop clamps are installed.
- (5) Position and install trunnion group (figs. 184 and 185) at each end of trunnion.
- (6) Connect four tube assemblies (figs. 186 and 204) on launcher base assembly and torque coupling nuts to 300 pound-inches.
- (7) Connect tube assemblies (fig. 184) to their respective swivel joints. Torque coupling nuts to 300 pound-inches.
- (8) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.
- (9) Bleed air from lines as prescribed in paragraph 89b (2) through (3.6).
- (10) Install trunnion dust cover (fig. 82), shield, launcher base shield assembly (fig. 183), and tubing rear cover.
- (11) Install the three access cover plates (view A, fig. 180) and beam center cover (fig. 82).

*g. Removal of Tube Assemblies, Fittings, and Clamps Located on Right Side of Launcher Base Assembly.*

- (1) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.
- (2) Depressurize hydraulic oil reservoir by turning handle of plug cock to VENT position and holding until all pressure is discharged.
- (3) Remove hydraulic tubing front cover (fig. 183), center cover, and rear cover.
- (4) Remove the three access cover plates (view A, fig. 180) and beam center cover (fig. 82).
- (5) Remove hydraulic tubing brackets (fig. 186) and loop clamps.
- (6) Remove tube assemblies and tube nipples. Cap all open lines.

*h. Installation of Tube Assemblies, Fittings, and Clamps Located on Right Side of Launcher Base Assembly.*

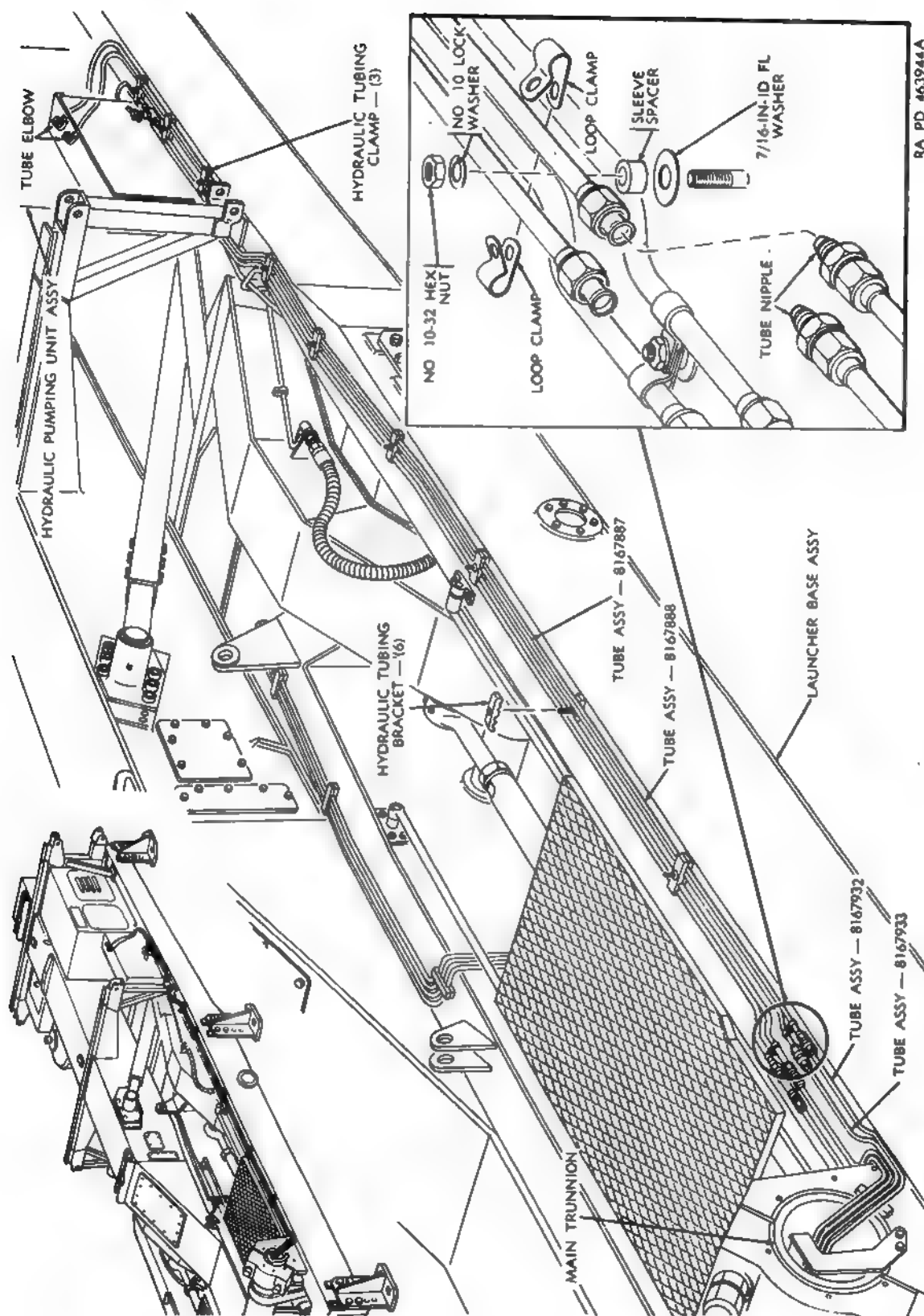
- (1) Install tube nipples and tube assemblies. Torque coupling nuts to 300 pound-inches.
- (2) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.
- (3) Bleed air from lines as prescribed in paragraph 89b (2) through (3.6).
- (4) Install hydraulic tubing front cover (fig. 183), center cover, and rear cover.
- (5) Install the three access cover plates (view A, fig. 180) and beam center cover (fig. 82).

## 90. Hydraulic Down-Lock System Hydraulic Network

The hydraulic down-lock system hydraulic network consists of tube assemblies, a rubber hose assembly, fittings, and a clamp necessary to provide a hydraulic pressure line to the hydraulic down-lock assembly.

*a. Removal.*

- (1) Raise erecting beam to up-and-locked position as described in paragraph 44.
- (2) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.



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Figure 186. Locking wedge system hydraulic network—removal and installation—continued.

- (3) Depressurize hydraulic oil reservoir by turning handle of plug cock to VENT position and holding until all pressure is discharged.
- (4) Remove panel cover (fig. 154).
- (5) Remove clamps (fig. 187), tube assemblies, elbow, restrictor check valve, and rubber hose assembly. Cap all open lines.

**b. Installation.**

- (1) Install tube assemblies and torque coupling nuts to values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167880	500
8167884	1000
8522062	500

- (2) Install elbow, rubber hose assembly, restrictor check valve, and clamps. Torque coupling nuts of tube assemblies to check valve to 500 pound-inches.
- (3) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.
- (4) Pressurize hydraulic oil reservoir by turning handle of plug cock to AIR position.

- (5) Bleed hydraulic down-lock (fig. 64) as prescribed in (a) and (b) below.

**Warning:** To prevent bodily injury from the descending launcher erecting beam (fig. 2), personnel should stand outside the launcher base while performing step (a) below:

- (a) Lower launcher erecting beam to approximately 70 degrees as described in TM 9-1440-250-20/1.
- (b) Loosen bleeder valve (fig. 64) on down-lock and permit fluid to flow. When fluid flows free of air, tighten plug until leakage stops.

**Caution:** Do not overtighten bleeder valve. Overtightening the valve will damage seating surface of valve and permit fluid leakage.

- (6) Install panel cover (fig. 154).

## 91. Erecting System Hydraulic Network

The erecting system hydraulic network consists of tube assemblies, hose assemblies, and clamps necessary to provide hydraulic pressure and return lines to the power cylinders (fig. 8).

*a. Removal of Erecting System Hydraulic Network in Hydraulic Panel.*

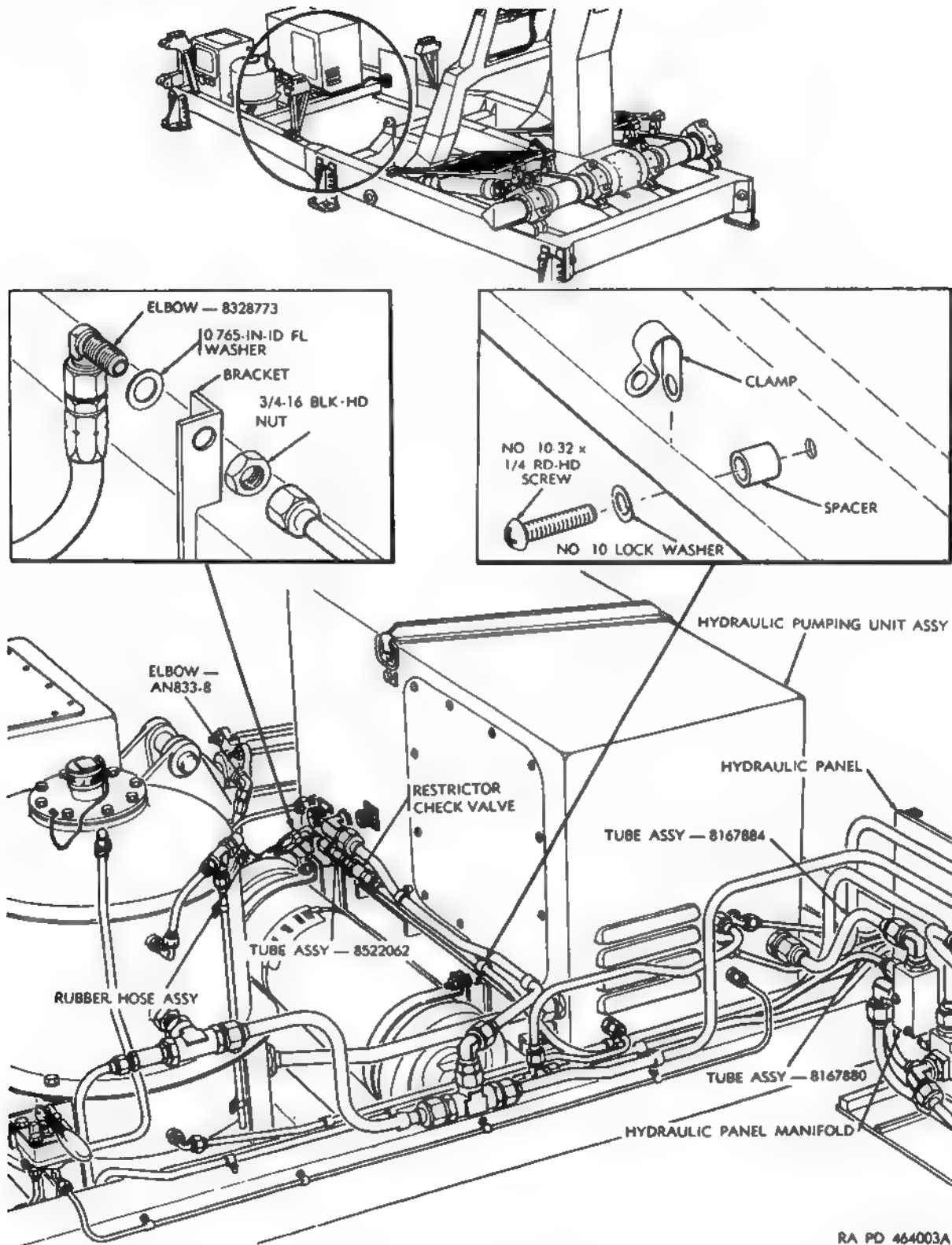


Figure 187. Hydraulic down-lock system hydraulic network—removal and installation.

- (1) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Remove the panel cover (fig. 154).
- (4) Remove tube assemblies (fig. 188) and tube tee to be replaced; cap all open lines.

*b. Installation of Erecting System Hydraulic Network in Hydraulic Panel.*

- (1) Install tube assemblies. Torque coupling nuts to values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167884	1000
8167885	1000
8167895	500
8167897	1000
8167899	1000
8167907	500
8167908	500
8167909	500
8167910	500
8167920	500
8167921	500
8167922	500
8167923	500
8525034	1000
8525035	1000
8525037	1000
9030292	1000
9030293	1000

- (2) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (3) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (4) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.
- (5) Install panel cover (fig. 154).

*c. Removal of Erecting System Hydraulic Network in Center Section of Launcher Base Assembly.*

- (1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.
- (2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (3) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (4) Remove clamps and supports securing tube assemblies (fig. 189) to launcher base.
- (5) Remove tube assemblies, tube nipple, tube tees, and tube reducers to be replaced; cap all open lines.

*d. Installation of Erecting System Hydraulic Network in Center Section of Launcher Base Assembly.*

- (1) Install tube assemblies, tube nipple, tube tees, and tube reducers. Torque coupling nuts to values specified in b(1) above.
- (2) Install clamps and supports to secure network.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (5) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.
- (6) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.

*e. Removal of Erecting System Hydraulic Network to Rubber Hoses.*

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

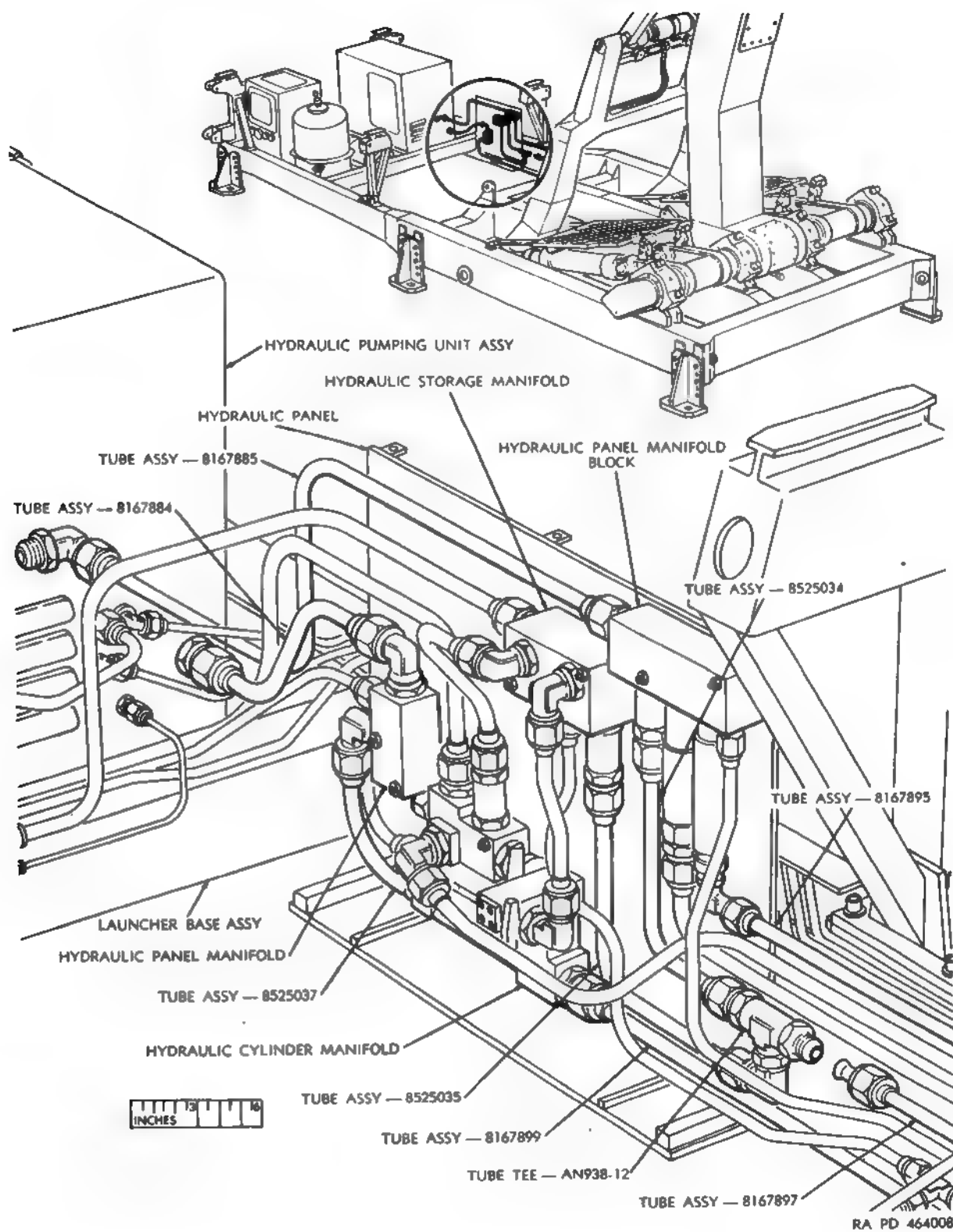
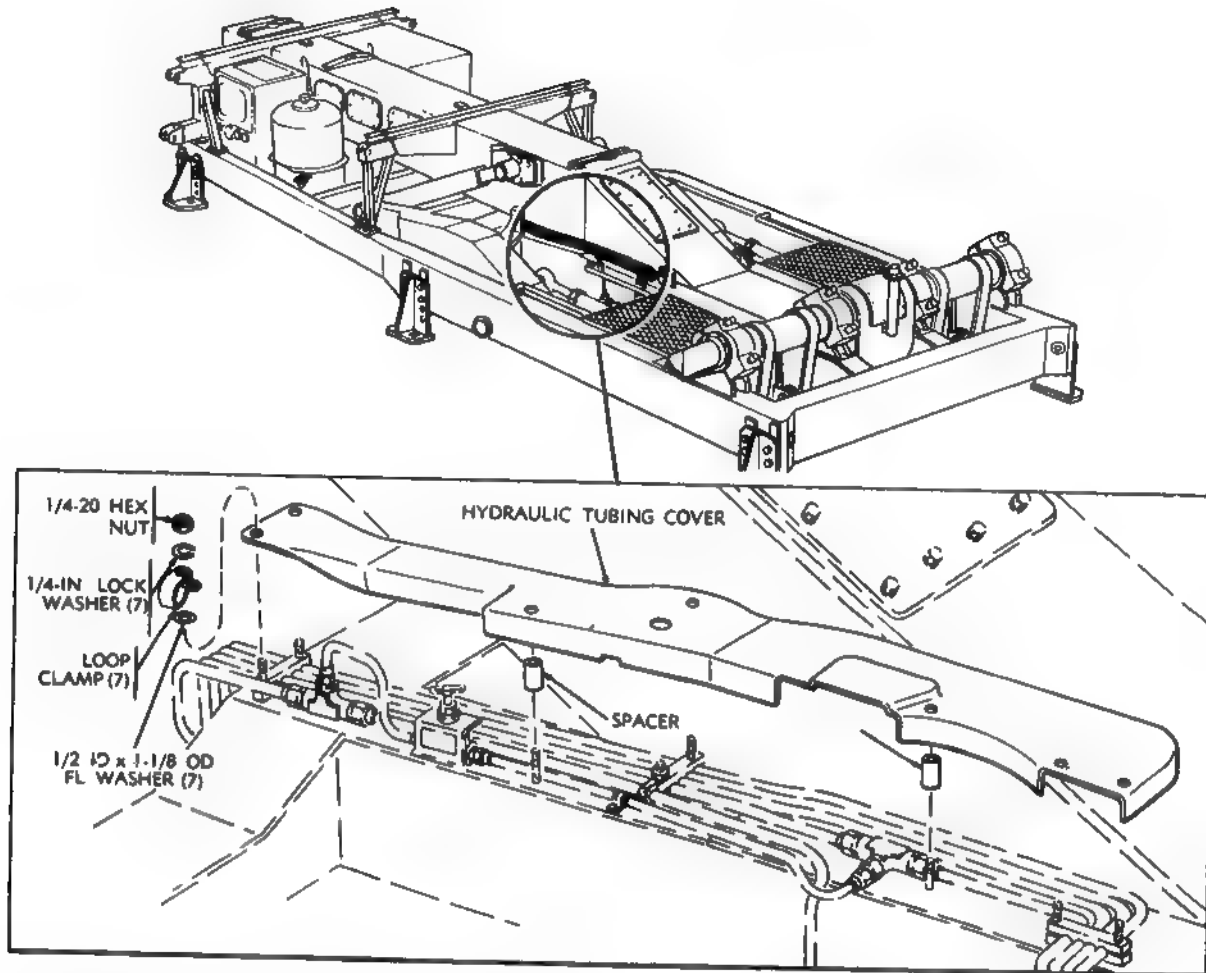


Figure 188. Erecting system hydraulic network — removal and installation.





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Figure 190. Hydraulic tubing cover—removal and installation.

- (3) Remove hydraulic tubing covers (fig. 180 and 190).
- (4) Remove launcher rack assembly as described in paragraph 61a (1) and (2).
- (5) Remove clamps (figs. 191 and 192) and supports securing tube assemblies to be replaced.
- (6) Remove tube assemblies (figs. 191, 192, and 193) to be replaced; cap all open lines.

*f. Installation of Erecting System Hydraulic Network to Rubber Hoses.*

- (1) Install tube assemblies and torque coupling nuts to values specified in b(1) above.
- (2) Install clamps and supports.
- (3) Close the EQUILIBRATOR SYSTEM

BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (5) Perform the hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.
- (6) Install hydraulic tubing cover (figs. 180 and 190).
- (7) Install launcher rack assembly as described in paragraph 61b (5) and (6).

## 92. Equilibrator System Hydraulic Network

The equilibrator system hydraulic network consists of tube assemblies, hose assemblies,

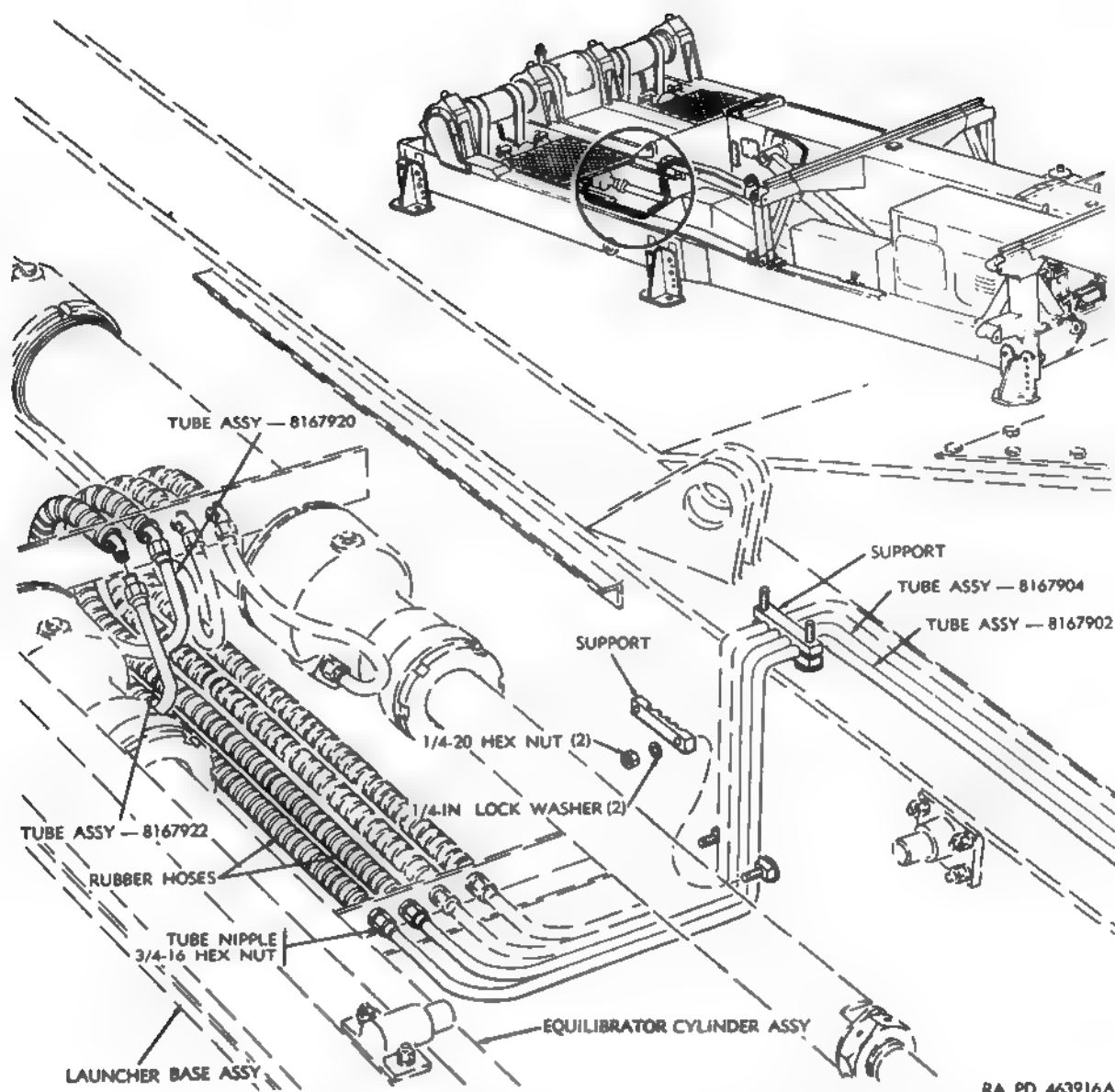


Figure 191. Erecting system hydraulic network—removal and installation.

valves, fitting, and clamps necessary to provide hydraulic pressure and return lines for the operation of the equilibrator cylinders (fig. 8).

*a. Removal of Equilibrator System Hydraulic Network in Hydraulic Panel.*

- (1) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.
- (2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and

the SYSTEM BY-PASS valve.

- (3) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (4) Remove the panel cover (fig. 154).
- (5) Remove clamps (fig. 194).
- (6) Remove pipe or tube assemblies and tube tee; cap all open lines.

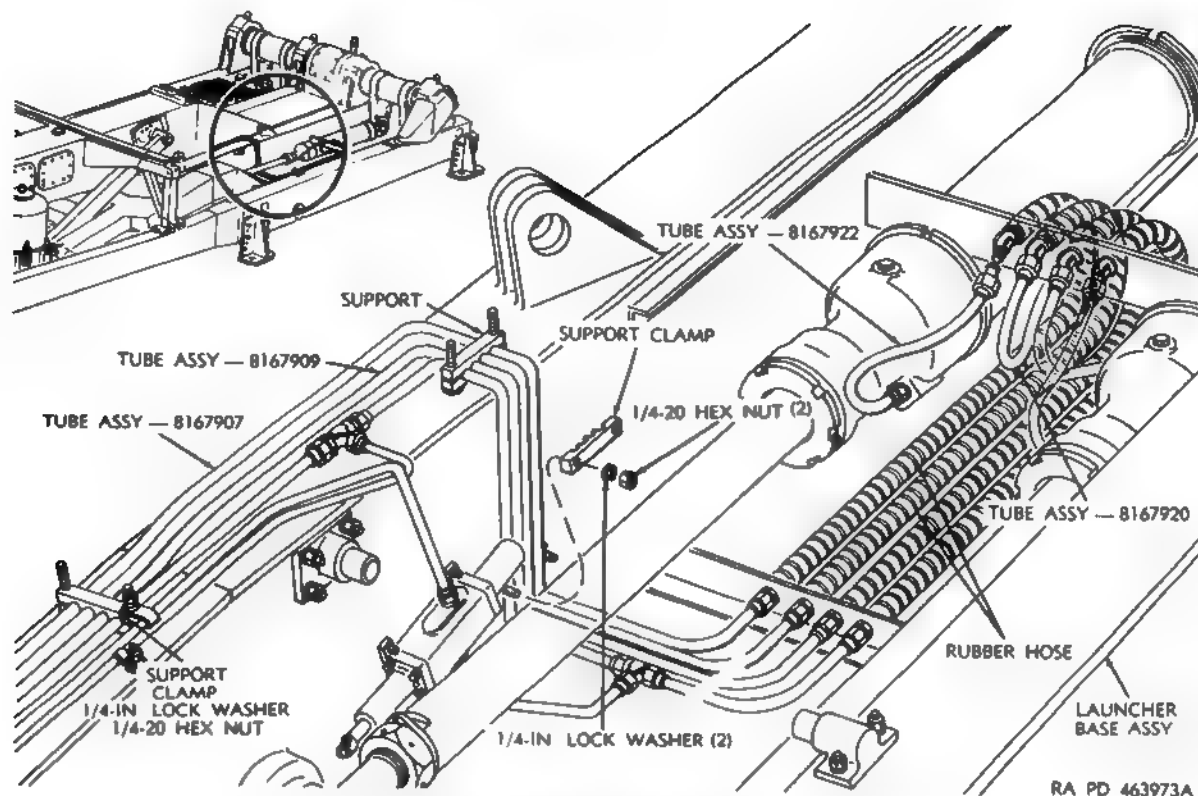


Figure 183. Erecting system hydraulic network—removal and installation—continued.

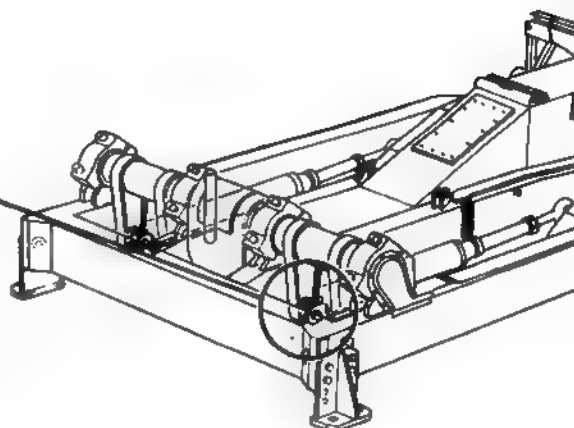
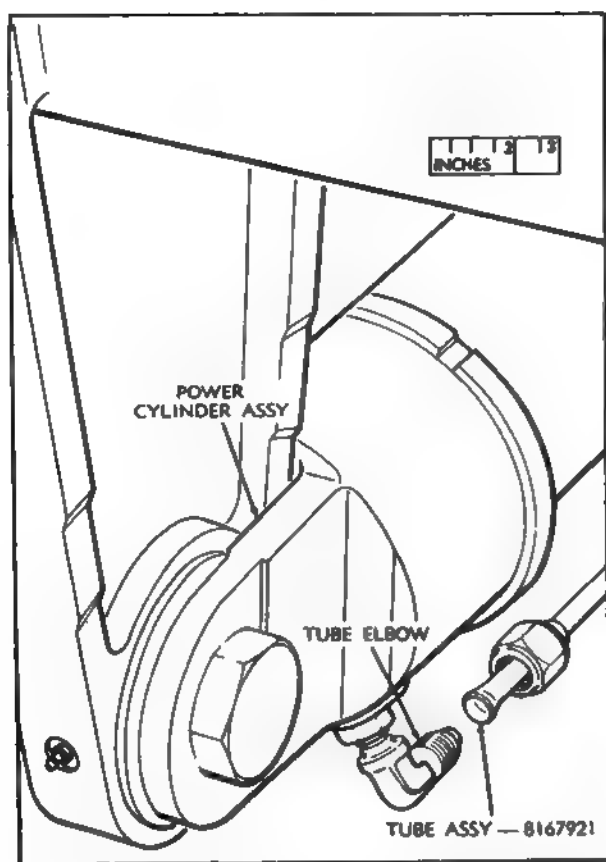
**b. Installation of Equilibrator System Hydraulic Network in Hydraulic Panel.**

- (1) Install pipe or tube assemblies and tube tee. Torque coupling nuts to values specified below:

Tube or pipe assembly	Torque value (pound-inches)
8167871	150
8167880	500
8167882	1000
8167885	1000
8167893	1000
8167894	500
8167898	1000
8167900	500
8167901	500
8167902	500
8167903	500
8167904	500
8167905	500

Tube or pipe assembly	Torque value (pound-inches)
8167920	500
8167921	500
8167922	500
8167923	500
8167924	1000
8525089	1000
9030294	1000
9030295	1000
9030296	500
9032293	500
9032294	500
9032295	1000
9032296	500

- (2) Install clamps and secure network to launcher base assembly.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.



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Figure 193. Erecting system hydraulic network - removal and installation - Continued.

- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (5) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.
- (6) Perform launcher hydraulic system air bleed procedure as described in paragraph 43.
- (7) Install the panel cover (fig. 154).

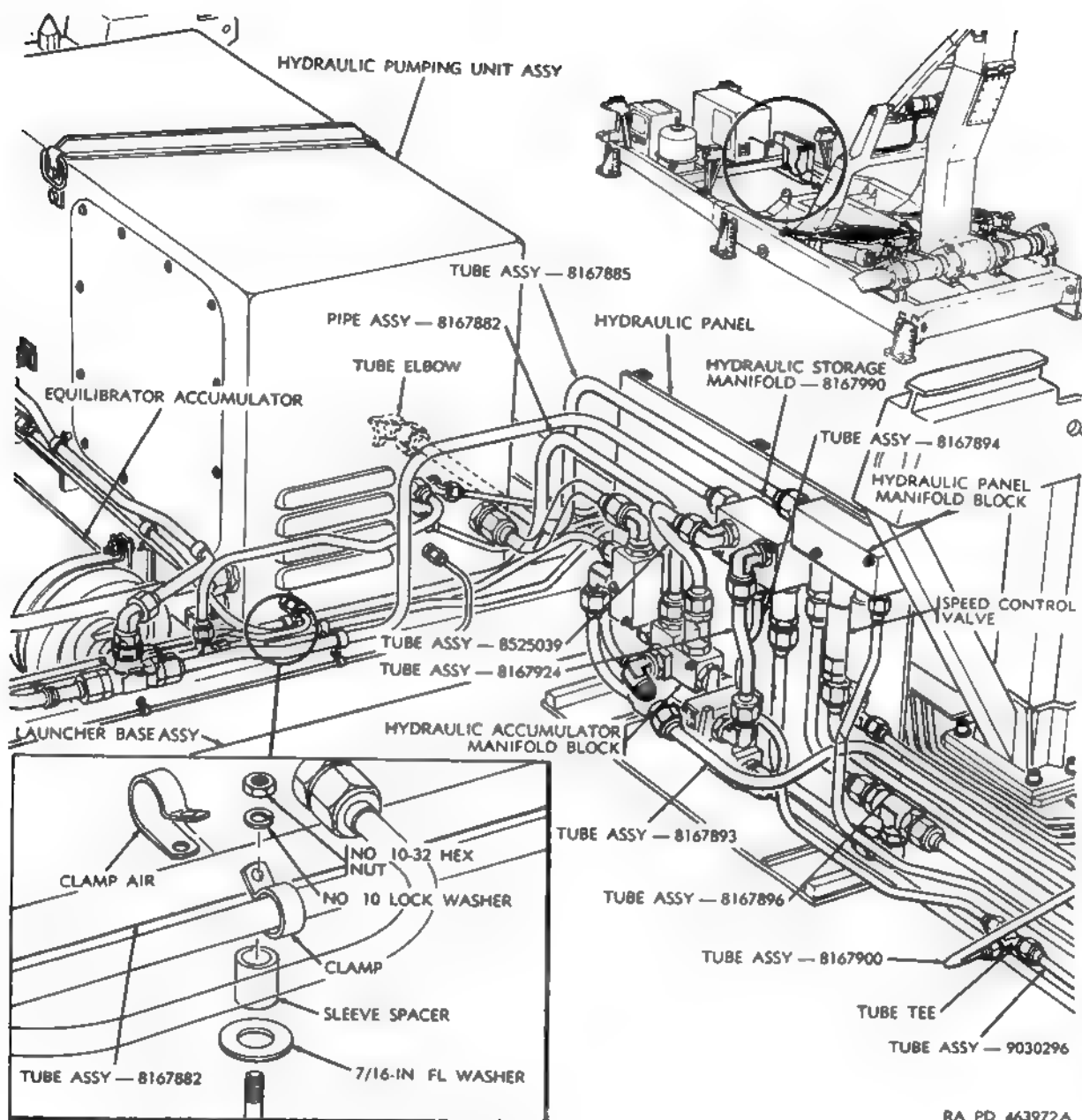
**c. Removal of Equilibrator System Hydraulic Network in Center Section of Launcher Base.**

- (1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.
- (2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (3) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (4) Remove clamps (fig. 195), pipe clamp, and tube saddle support.
- (5) Remove tube assemblies, tube nipples, reducers, and tube tees to be replaced; cap all open lines.

**d. Installation of Equilibrator System Hydraulic Network in Center Section of Launcher Base.**

- (1) Install tube assemblies, tube nipples, reducers, and tube tees. Torque coupling nuts to values specified in b(1) above.
- (2) Install clamps and secure network to launcher base assembly.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve.



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Figure 194. Equilibrator system hydraulic network—removal and installation.

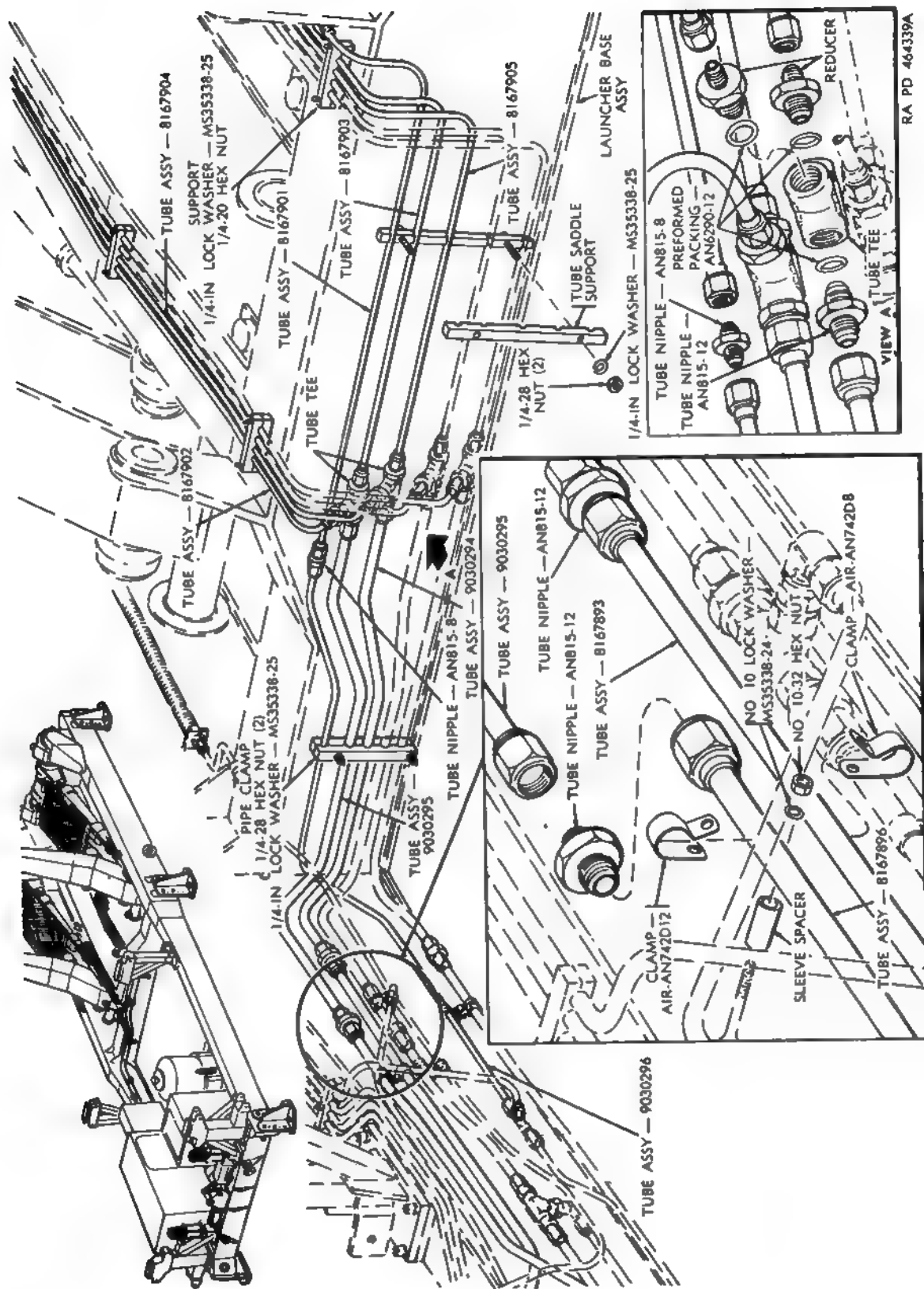
TEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (5) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.
- (6) Perform the launcher hydraulic sys-

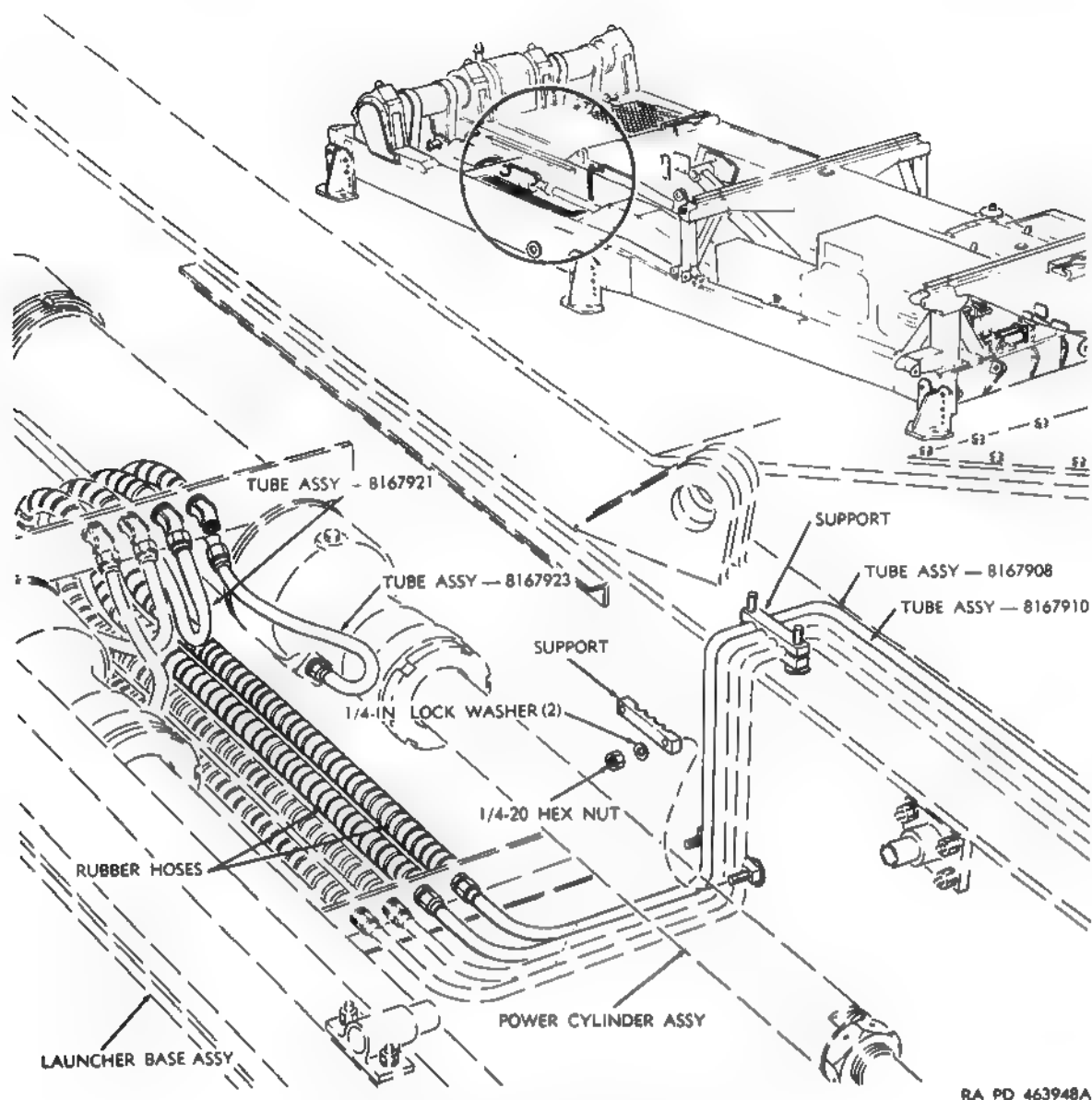
tem air bleed procedure as described in TM 9-1440-250-20/1.

*e. Removal of Equilibrator System Hydraulic Network to Rubber Hoses.*

- (1) Remove launcher rack assemblies as described in paragraph 61a (1) and (2).
- (2) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.



**Figure 195. Equilibrator system hydraulic network—removal and installation—continued.**



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Figure 196. Equilibrator system hydraulic network—removal and installation—continued.

- (3) Remove hydraulic tubing covers (figs. 180 and 190).
  - (4) Remove supports (fig. 196), support clamps (fig. 197), and hydraulic tubing supports securing tube assemblies to be replaced.
  - (5) Remove tube assemblies (figs. 196, 197 and 198), tube nipples, reducers and tube tees to be replaced; cap all open lines.
  - (6) Remove EQUILIBRATOR SYSTEM BY-PASS valve group (fig. 177) and cap both open lines.
  - (7) Remove cam-operated valve group (fig. 173) and cap both open lines.
- f. Installation of Equilibrator System Hydraulic Network to Rubber Hoses.*
- (1) Install cam-operated valve group.
  - (2) Install EQUILIBRATOR SYSTEM BY-PASS valve group (fig. 177).
  - (3) Install tube assemblies (figs. 196, 197, and 198) tube nipples, reducers,

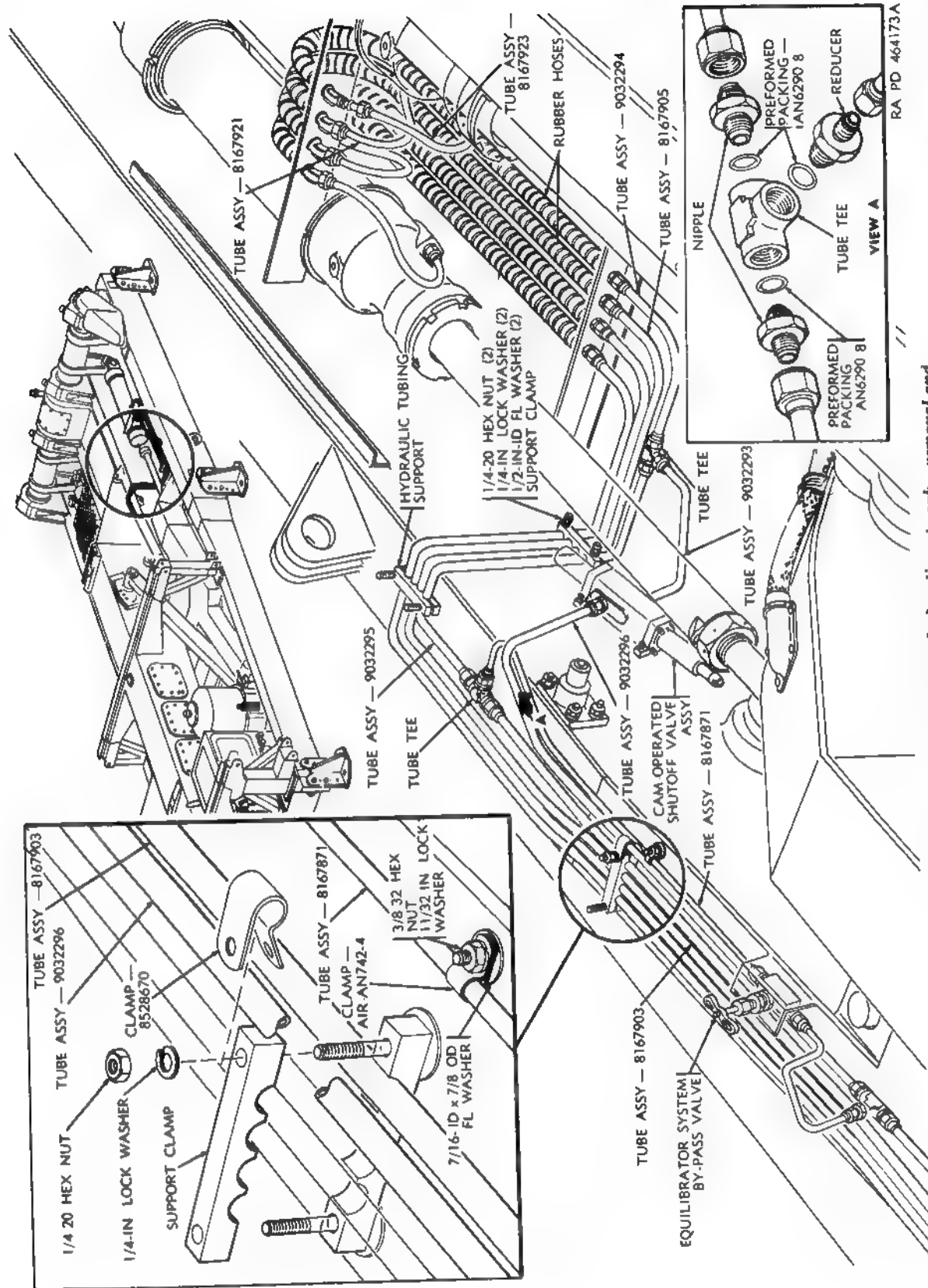


Figure 197. Equibrator system hydraulic network—removal and installation—continued.

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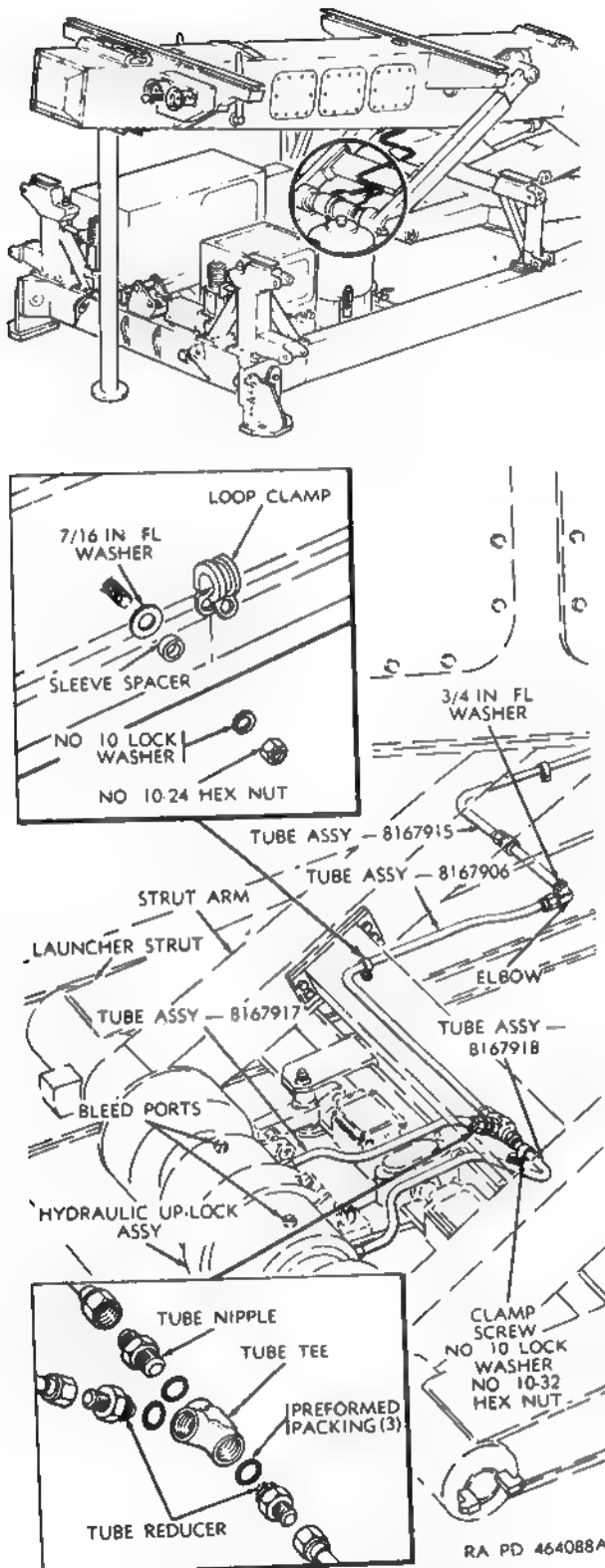


Figure 199. Hydraulic up-lock system hydraulic network—removal and installation.

200), tube nipples (figs. 199 and 200), tube reducers (fig. 199), and tube tee.

- (6) Remove tube assemblies (figs. 199 and 200); cap all open lines.

*b. Installation of Hydraulic Up-Lock System Hydraulic Network.*

- (1) Install rubber hose assembly (fig. 200), tube assemblies (figs. 199 and 200), tube nipples, tube reducers (fig. 199), and tube tee. Torque coupling nuts to values specified below:

Tube assembly	Torque value (pound-inches)
8167885	1000
8167898	500
8167906	500
8167915	500
8167917	200
8167918	200

- (2) Install loop clamps (figs. 199 and 200) and secure network.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (4) Pressurize the hydraulic oil reservoir by turning the handle of the plug cock to the AIR position.
- (5) Install the panel cover (fig. 154).
- (6) Remove the erecting beam support-9029892 as described in paragraph 36d.
- (7) Perform the launcher hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.

#### 94. Missile Hydraulic System Network

The missile hydraulic system network consists of the tube assemblies, fittings, and clamps that connect the hydraulic pumping unit (fig. 8) to the Nike-Ajax launching and handling rail M1A1 or M1A2 and to the loading rack test stations.

*a. Removal of Missile Hydraulic System Network between Front End Cover and Beam Center Cover.*

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug

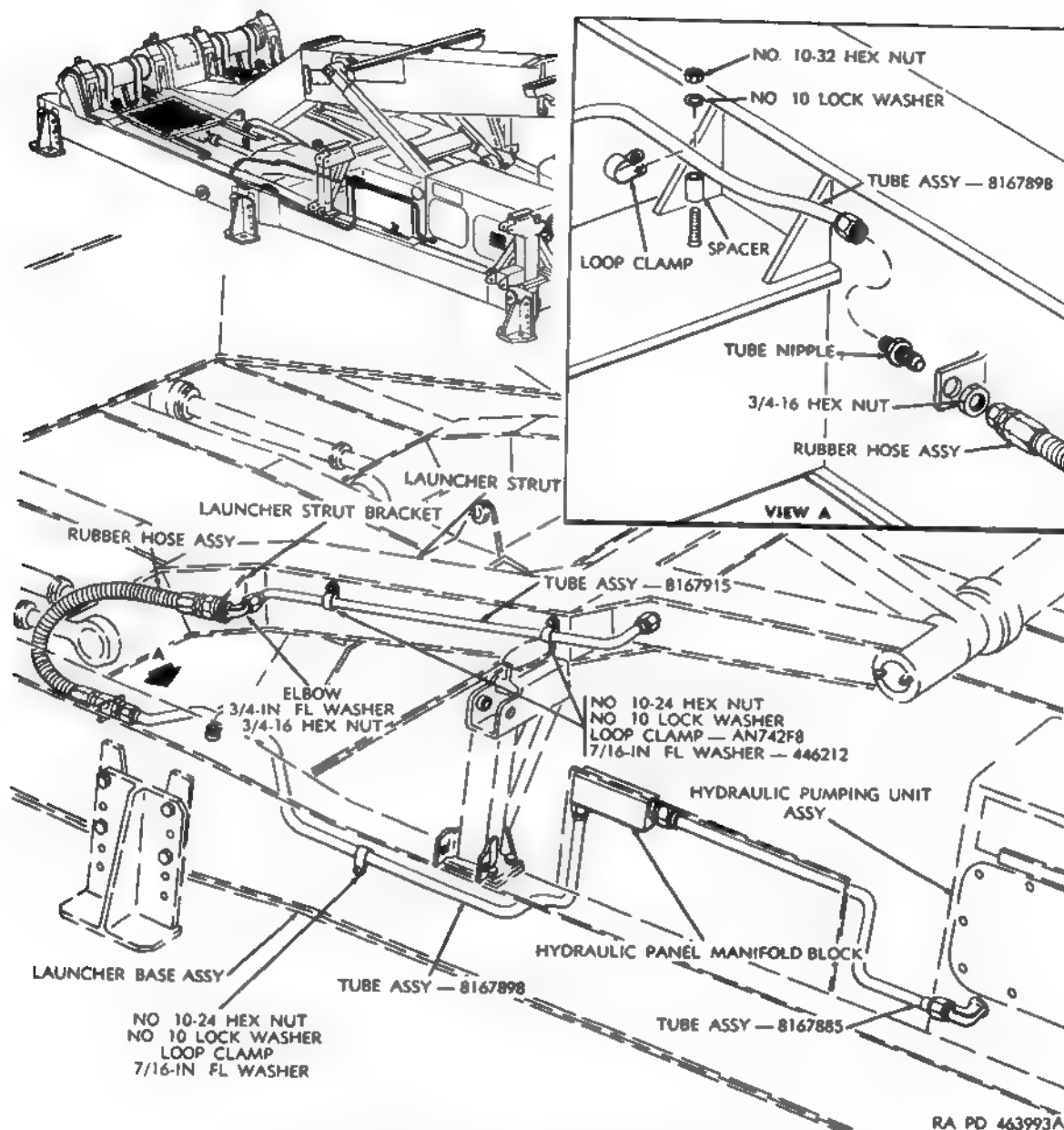


Figure 200. Hydraulic up-lock system hydraulic network—removal and installation—continued.

- cock to the VENT position and holding until all pressure is discharged.
- (3) Remove the three plates (view A, fig. 180) and front end cover.
  - (4) Remove beam center cover (fig. 82).
  - (5) Remove clamps (figs. 201 and 202), and tubing supports (fig. 202).
  - (6) Remove tube assemblies (figs. 201 and 202), tube nipples, tube elbows, and restrictor assembly (fig. 202).

- (7) Remove coupling assembly and quick-disconnect coupling half assembly (fig. 201). Cap all open lines.
- b. Installation of Missile Hydraulic System Network between Front End Cover and Beam Center Cover.*

- (1) Install tubing supports (fig. 202), restrictor check valve, tube nipples (fig. 201 and 202), tube elbows, tube assemblies and loop clamps.

- (2) Install pipe-to-tube elbows (fig. 201), coupling assembly, and quick-disconnect coupling half assembly.
- (3) Torque coupling nuts of all tube assemblies (figs. 201 and 202) to values specified below:

<i>Tube assembly</i>	<i>Torque value (pound-inches)</i>
8167789	500
8167790	500
8167794	500
8167795	500
8167796	500
8167873	300
8167874	300
8167886	500
8167889	500
8167890	500
8167891	500
8167900	500
8167925	500
8167928	300
8167931	300
8167934	300
8525042	300
8525043	300
8525280	500
8525281	500
9032848	500

- (4) Install beam center cover (fig. 82).
- (5) Install the three access cover plates (view A, fig. 180) and the front end cover.
- (6) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (7) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

*c. Removal of Missile Hydraulic System Network between Rear Locking Wedge and Main Trunnion.*

- (1) Remove beam center cover and erecting beam trunnion dust cover (fig. 82).
- (2) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.
- (3) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (4) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (5) Remove clamps (fig. 203), tubing supports, and hydraulic erecting beam spacer.
- (6) Remove tube assemblies, tube elbows, and tube reducers; cap all open lines.

*d. Installation of Missile Hydraulic System Network between Rear Locking Wedge and Main Trunnion.*

- (1) Install tube elbows, tube reducers, and tube assemblies; torque coupling nuts to values specified in b(1) above.
- (2) Install clamps, tubing supports, and hydraulic erecting beam spacer.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

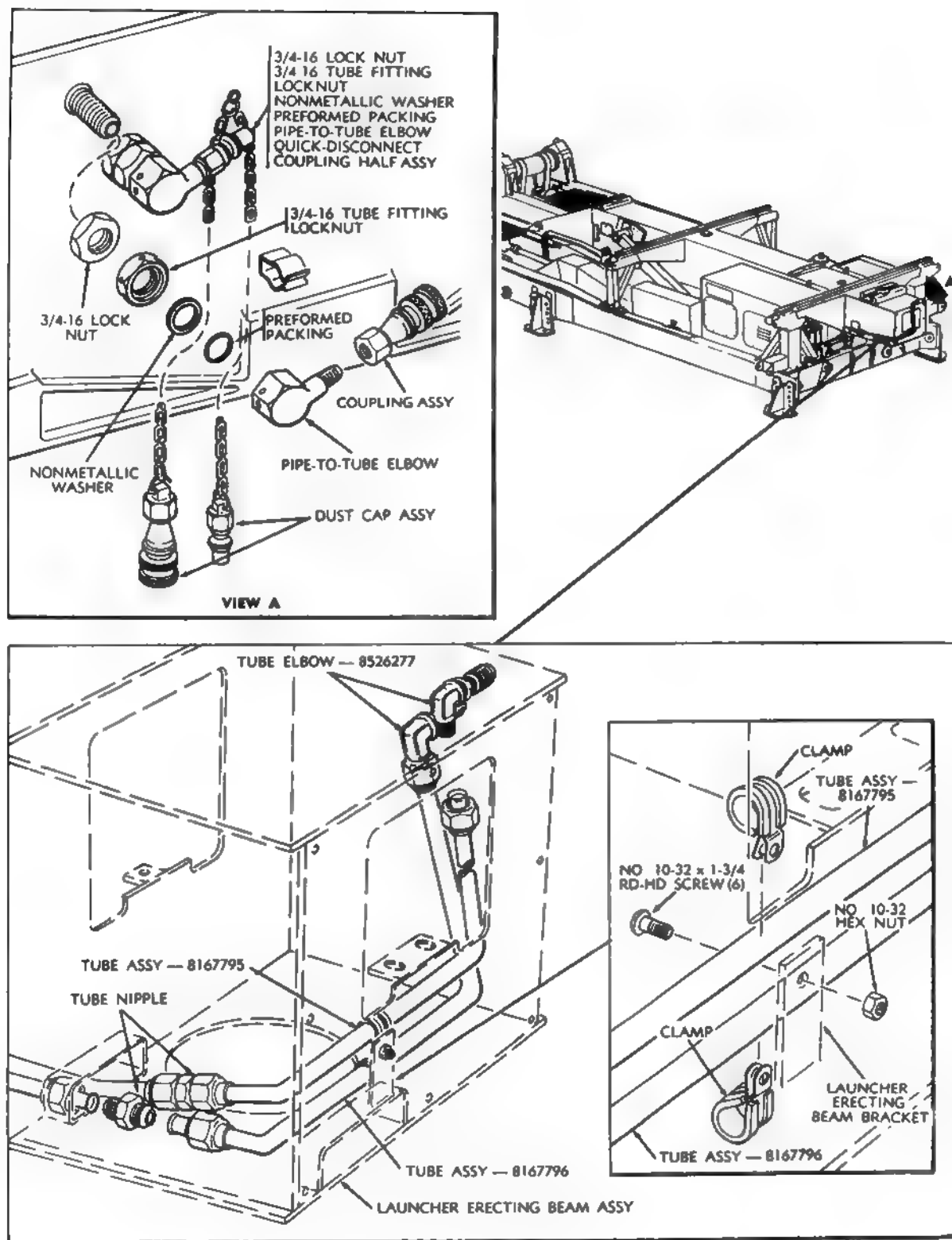
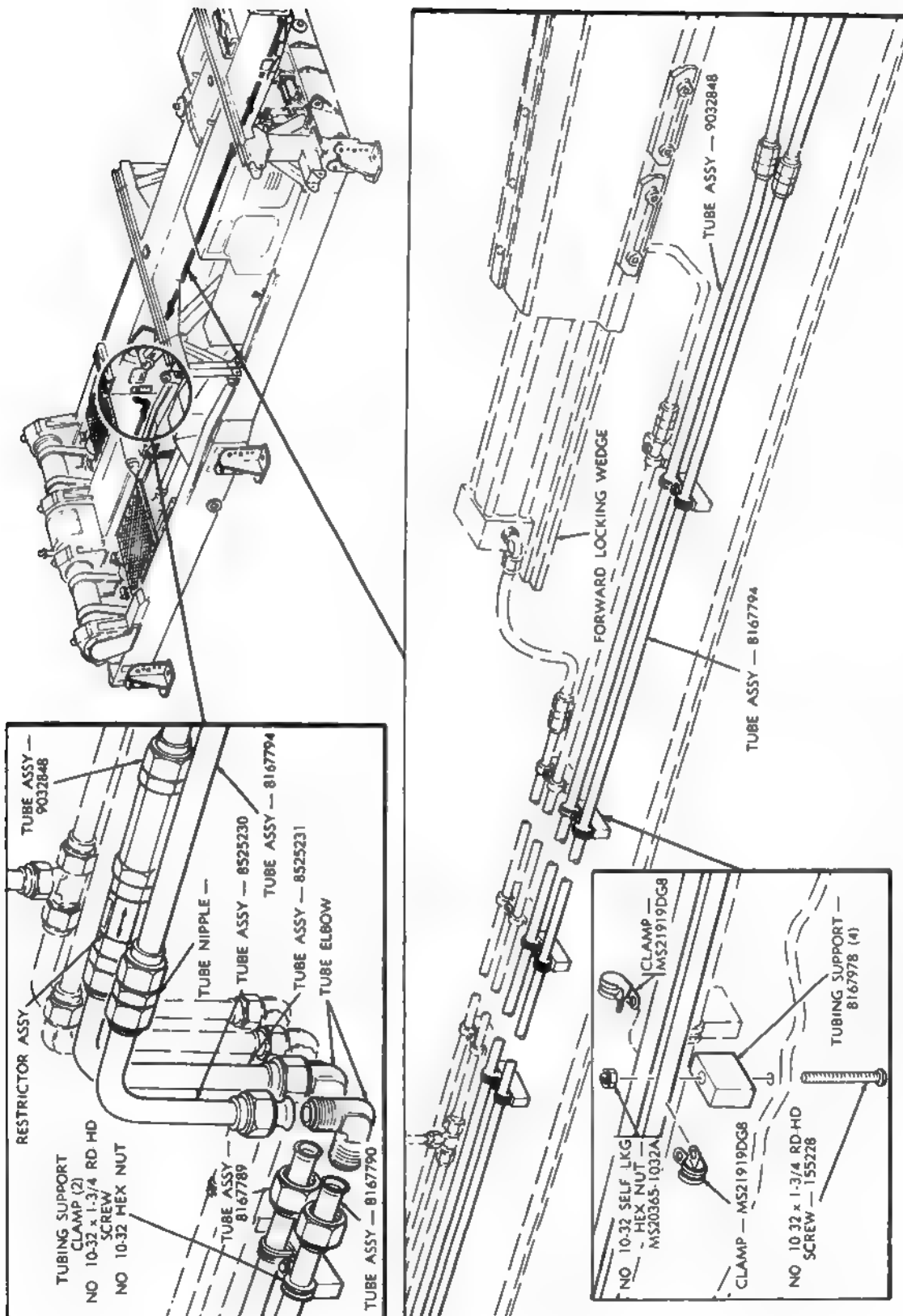


Figure 201. Missile hydraulic system network—removal and installation.



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Figure 202. Missile hydraulic system network—removal and installation—continued.

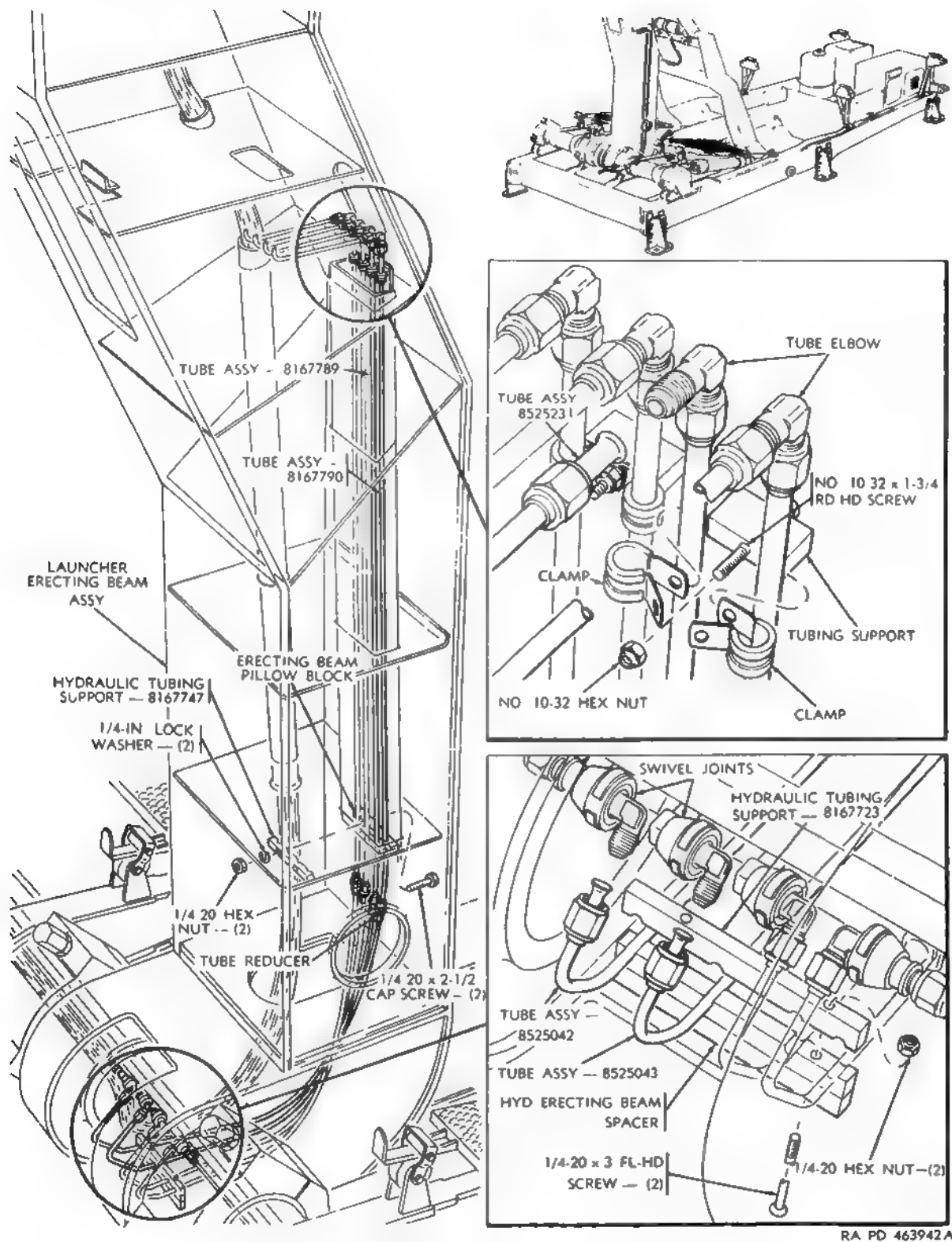


Figure 203. Missile hydraulic system network—removal and installation—continued.

- (5) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.

- (6) Install beam center cover erecting beam trunnion dust cover (fig. 82).

*e. Removal of Missile Hydraulic System Network on Right Side of Launcher Base Assembly.*

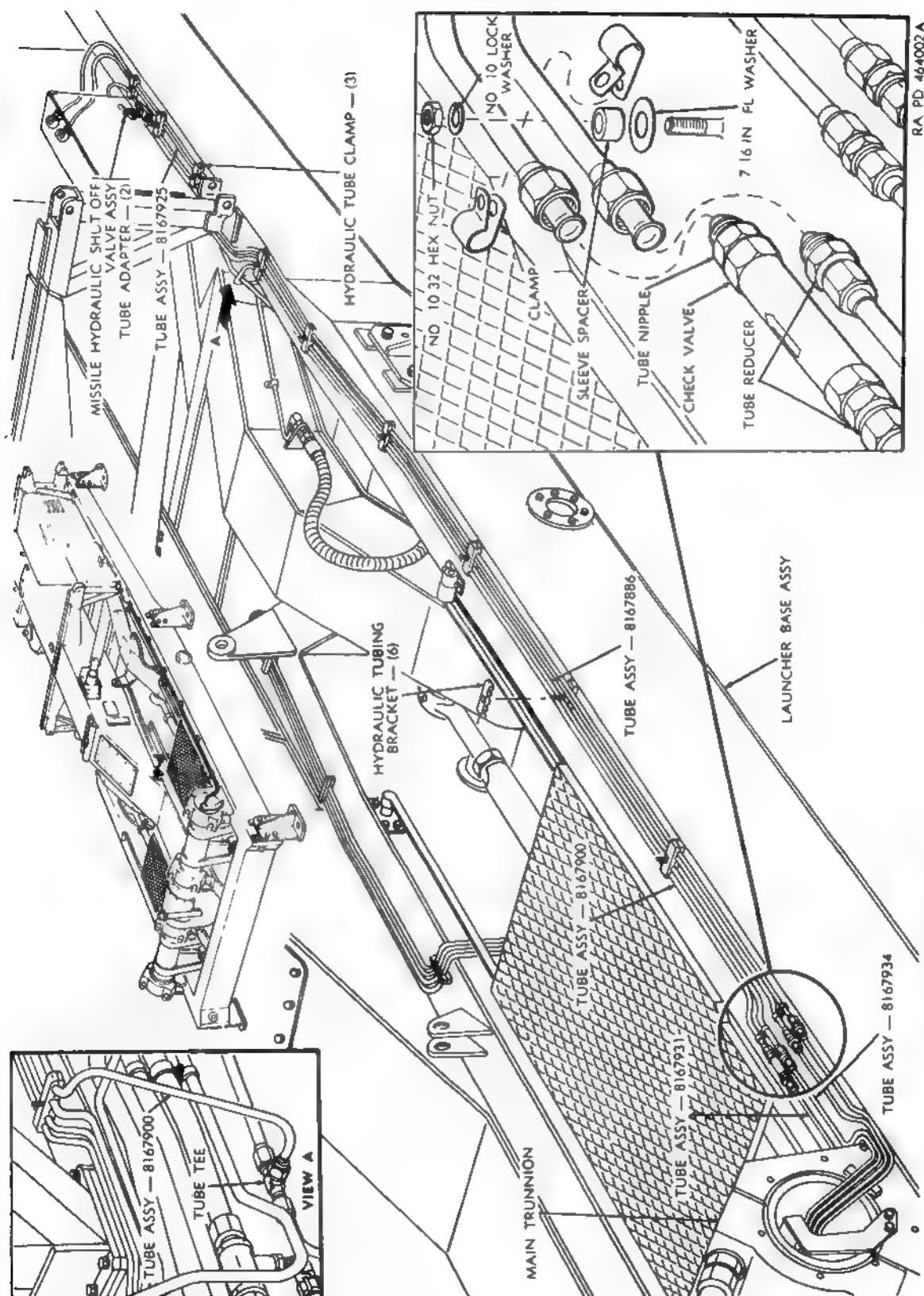
- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS VALVE.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Remove trunnion dust cover (fig. 82) and shield.
- (4) Remove launcher base shield assembly (fig. 183).
- (5) Remove hydraulic tubing rear cover, center cover, and front cover.
- (6) Disconnect the four tube assemblies (figs. 186 and 204) near main trunnion. Cap all open lines.
- (7) Disconnect the four tube assemblies (figs. 182 and 203) from the swivel joints. Cap all open lines.
- (8) Remove the support trunnion group as described in paragraph 89e (7) through (11).
- (9) Remove supports (fig. 205), tube nipple, tube elbow, tube assemblies, hydraulic inboard swivel joint assembly and tube swivel joint assembly. Cap all open lines.
- (10) Remove six hydraulic tubing brackets (fig. 204) and three hydraulic tube clamps.
- (11) Remove tube assemblies, MISSILE HYDRAULIC SHUT-OFF valve assembly, and two tube adapters.
- (12) Remove tube tee.
- (13) Remove check valve and tube nipple.
- (14) Disassemble valve assembly (fig. 147).

*f. Installation of Missile Hydraulic System Network on Right Side of Launcher Base Assembly.*

- (1) Assemble globe valve assembly.
- (2) Install hydraulic inboard swivel joint assembly (fig. 205) and tube swivel joint assembly on support trunnion.
- (3) Install tube elbow and tube nipple.
- (4) Install tube assemblies and supports.
- (5) Install support trunnion group as described in paragraph 89f (2) through (6).
- (6) Connect swivel joint assemblies (figs. 182 and 203) to tube assemblies. Torque coupling nuts to values specified in b(1) above.
- (7) Install tube assemblies (fig. 204), three hydraulic tubing clamps, six hydraulic tubing brackets, tube nipples, and check valve.
- (8) Install MISSILE HYDRAULIC SHUT-OFF valve assembly, two tube adapters, and tube tee.
- (9) Torque coupling nuts of tube assemblies to values specified in b(1) above.
- (10) Install shield (fig. 82) and erecting beam trunnion dust cover.
- (11) Install launcher base shield assembly (fig. 183) and the hydraulic tubing front, center, and rear covers.
- (12) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (13) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

*g. Removal of Missile Hydraulic System Network between Hydraulic Panel and Hydraulic Oil Reservoir Assembly.*

- (1) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-20/1.



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Figure 204. Missile hydraulic system network—removal and installation—continued.

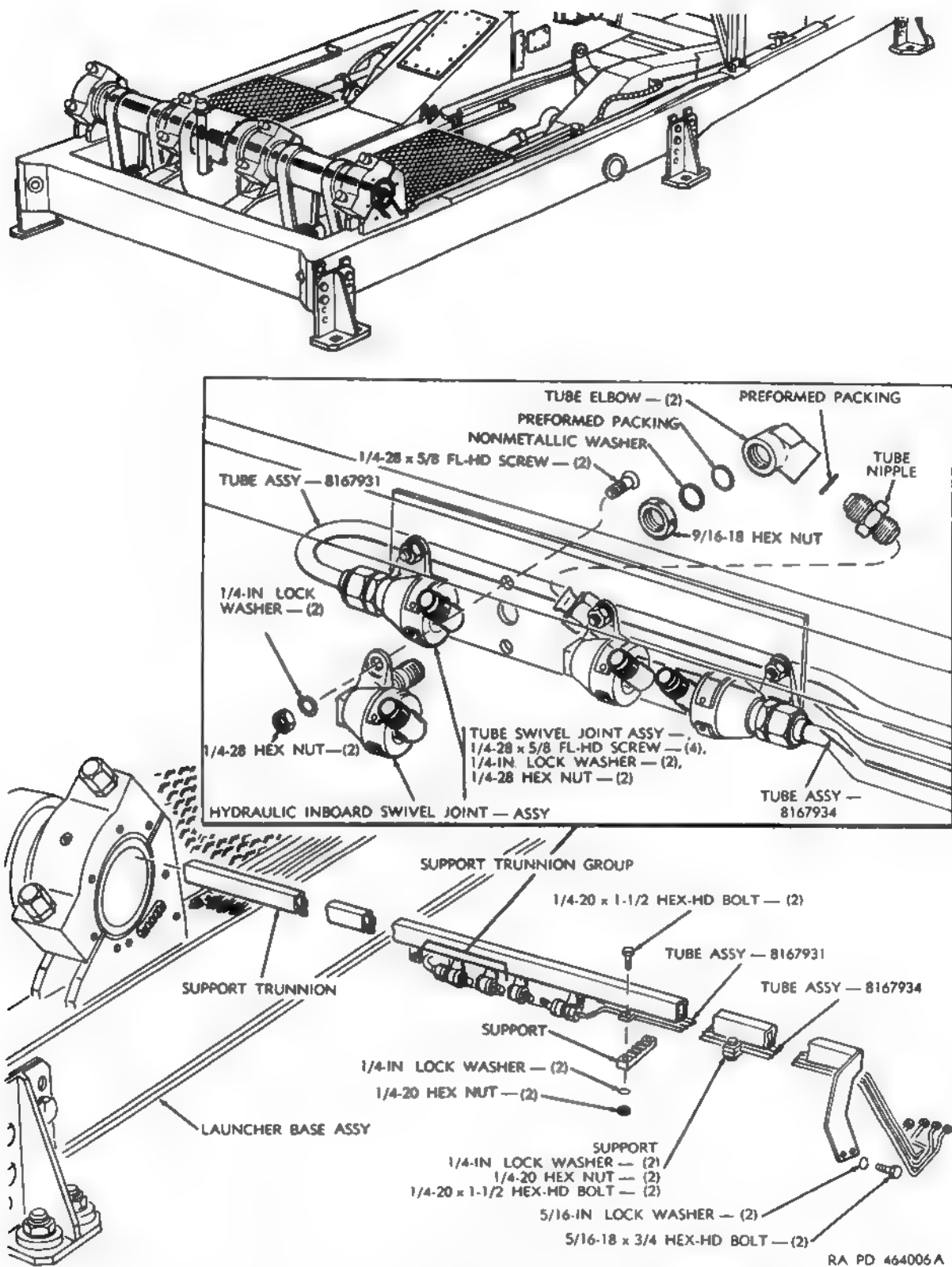


Figure 205. Missile hydraulic system network—removal and installation—continued.

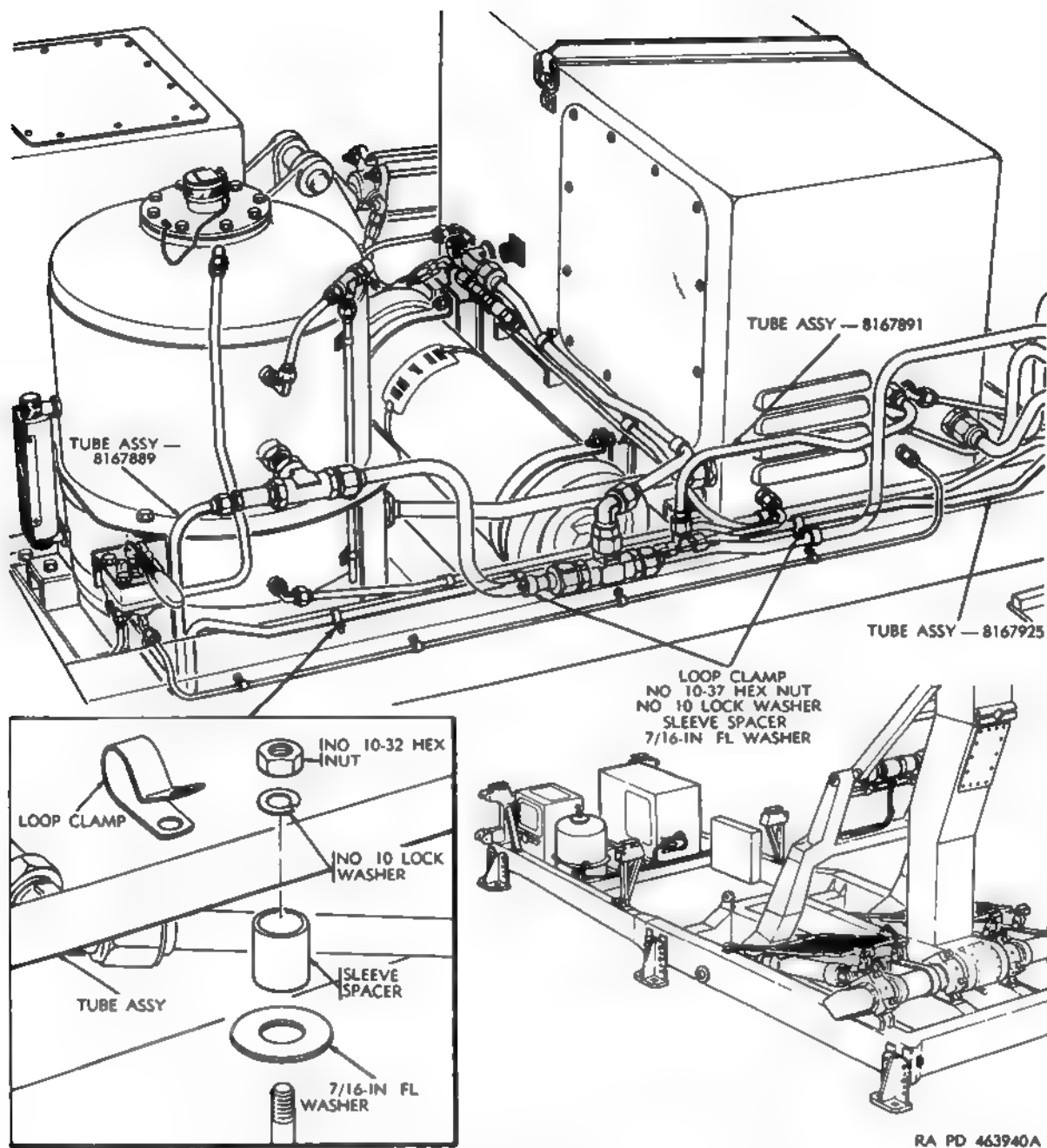


Figure 206. Missile hydraulic system network—removal and installation—continued.

- (2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (3) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (4) Remove loop clamps (fig. 206) and sleeve spacers.

- (5) Remove the tube assemblies to be replaced and cap all open lines.

*h. Installation of Missile Hydraulic System Network between Hydraulic Panel and Hydraulic Oil Reservoir Assembly.*

- (1) Install tube assemblies and torque coupling nuts to values specified in b(1) above.
- (2) Install loop clamps and sleeve spacers.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (5) Lower the launcher erecting beam to the down-and-locked position as described in TM 9-1440-250-20/1.

*i. Removal of Missile Hydraulic System Network between Hydraulic Oil Reservoir Assembly and Power Distribution Box Assembly.*

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Remove clamps (fig. 207), sleeve spacers, tube assemblies, fluid flow restrictor (view A, fig. 207) and two tube reducers. Cap all open lines.

*j. Installation of Missile Hydraulic Network between Hydraulic Oil Reservoir Assembly and Power Distribution Box Assembly.*

- (1) Install tube assemblies, fluid flow restrictor, and tube reducers. Torque coupling nuts to values specified in b(1) above.
- (2) Install sleeve spacers and clamps and secure network to launcher base assembly.
- (3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

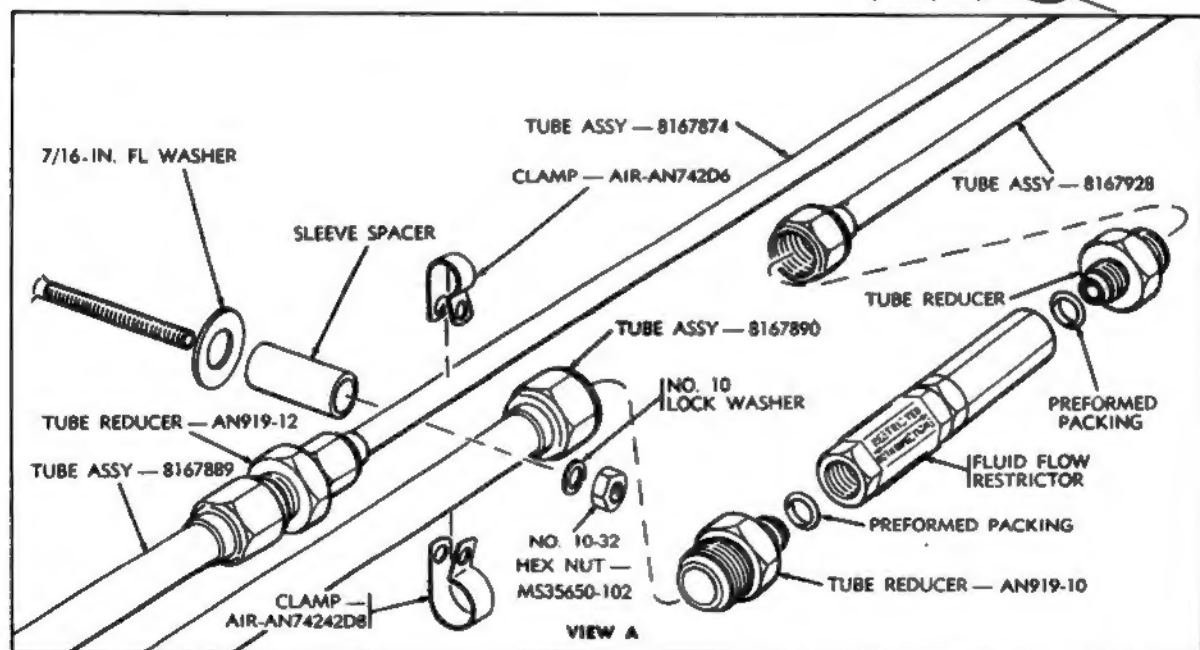
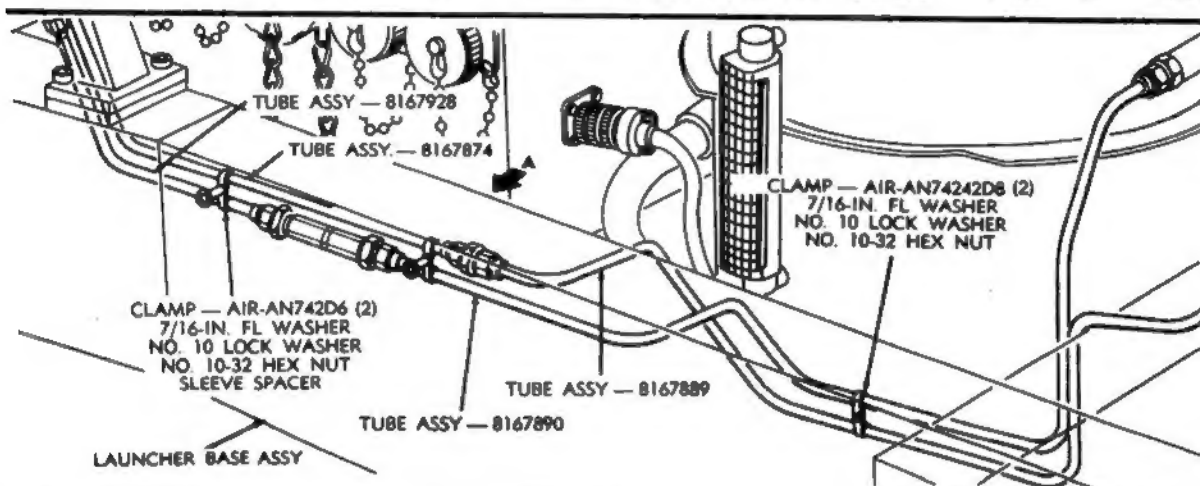
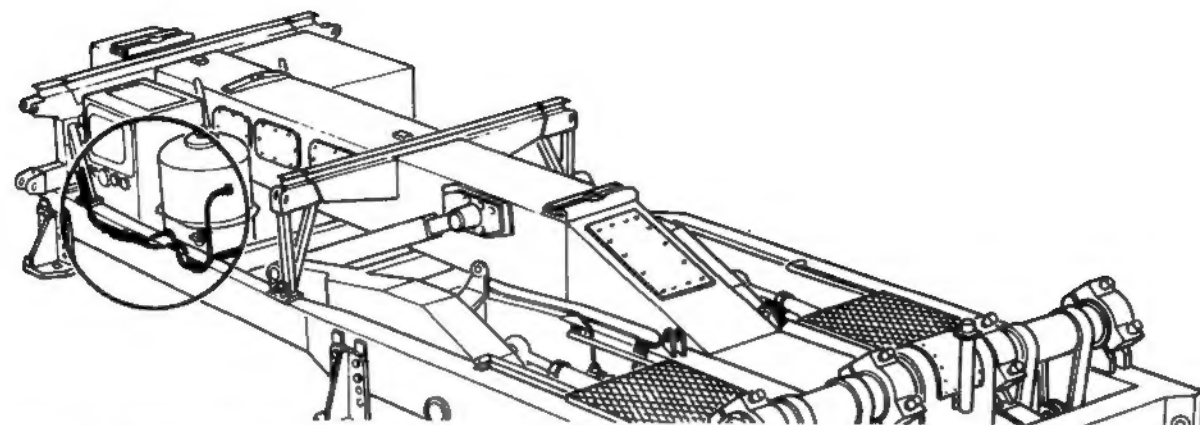
- (4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

*k. Removal of Missile Hydraulic System Network at Quick-Disconnect Coupling Half Assemblies.*

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Remove the by-pass valve tube assembly (fig. 208) and MISSILE HYDRAULIC SHUT-OFF valve assembly and two adapters. Cap all open lines.
- (4) Remove the quick-disconnect coupling half assemblies and unions. Cap all open lines.
- (5) Disassemble valve assembly (fig. 147).

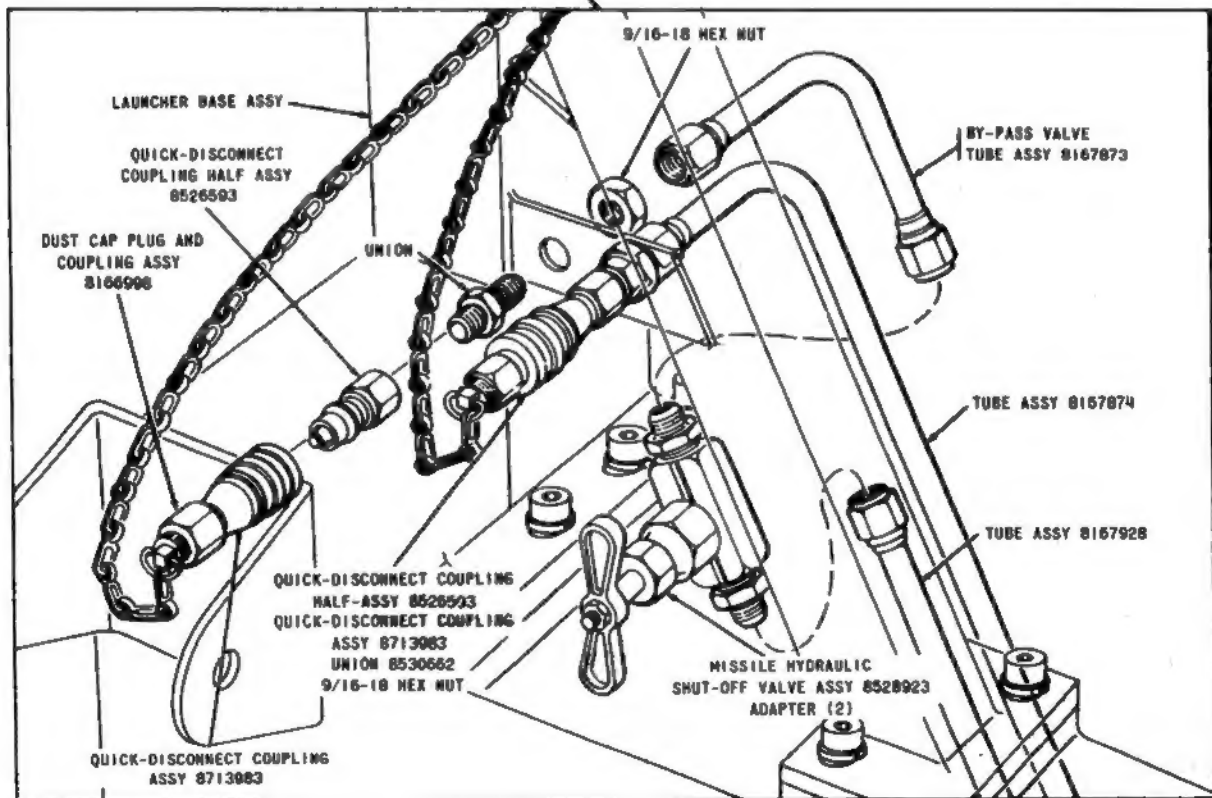
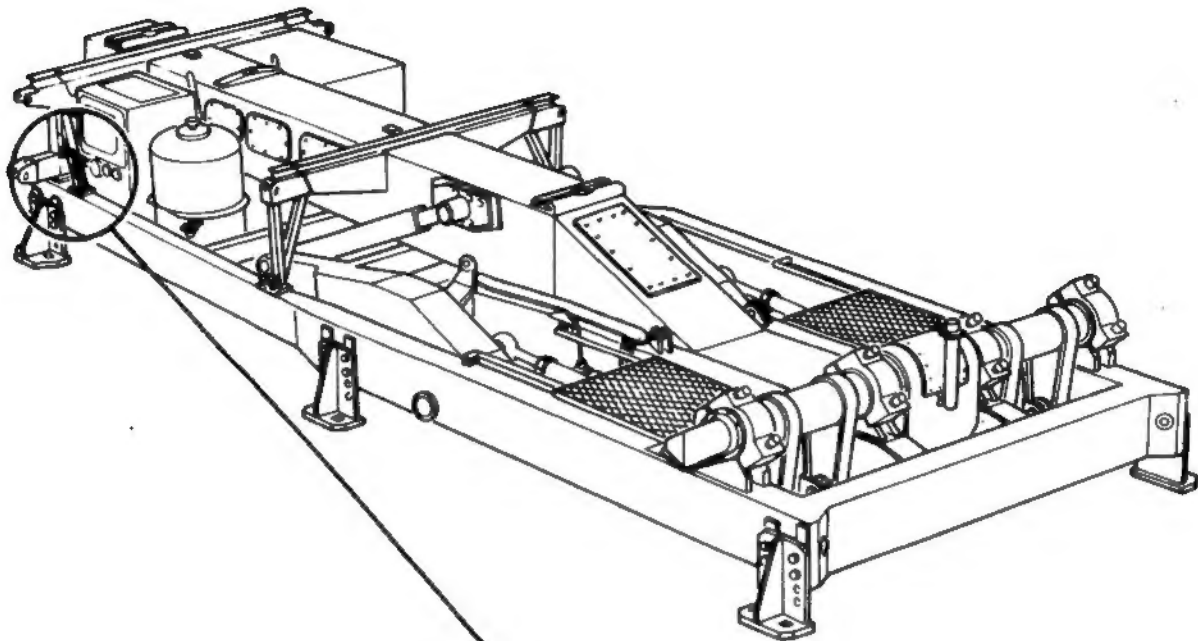
*l. Installation of Missile Hydraulic System Network at Quick-Disconnect Coupling Half Assemblies.*

- (1) Assemble valve assembly.
- (2) Install the MISSILE HYDRAULIC SHUT-OFF valve assembly (fig. 208) and by-pass valve tube assembly. Torque coupling nuts to values specified in b(1) above.
- (3) Install two unions and two quick-disconnect coupling half assemblies.
- (4) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (5) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (6) Perform the launcher hydraulic system air bleed procedure as described in TM 9-1440-250-20/1.



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Figure 207. Missile hydraulic system network—removal and installation—continued.



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Figure 208. Missile hydraulic system network — removal and installation — Continued.

## SECTION VII. MAINTENANCE OF RUBBER HOSE ASSEMBLY BRACKET GROUP AND POWER AND EQUILIBRATOR CYLINDER ASSEMBLIES

### 95. General

This section covers the maintenance of a typical power or equilibrator cylinder assembly and a rubber hose assembly bracket group. The general precautions in paragraph 58 must be observed when any hydraulic system maintenance is performed.

### 96. Hose Assembly Bracket Group

#### a. Removal.

*Note.* Place a suitable container under the cylinder assembly (25, fig. 209) being removed, to catch the hydraulic fluid.

- (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (3) Remove the launcher rack assembly as described in paragraph 61a(1) and (2).
- (4) Remove the U-bolts (3, fig. 209).
- (5) Disconnect the tube assemblies (4, 5, 6, and 7).
- (6) Disconnect the hose assemblies (8).
- (7) Remove the bracket group (9).
- (8) Cap all open tube assemblies and hose assemblies to prevent the entry of foreign material.

b. *Disassembly.* Disassemble the bracket group (fig. 210) as required.

c. *(Deleted)*

d. *Installation.* At least two men are required to accomplish this procedure. An additional rubber hose assembly (1 of step A, fig. 210.1) and a union (2 of step A) are used to assemble and install the hose assembly bracket group (fig. 210). Obtain these two parts before

proceeding with (1) below.

- (1) Join the two rubber hose assemblies (1 and 3 of step A, fig. 210.1) together using a union (2 of step A).
- (1.1) Slide the hose assemblies (1 and 3 of step B) through a metal hose (4 of step B).
- (1.2) Connect the rubber hose assembly (3 of step B) on the nipple (step B) of the launcher and torque to 500 pound-inches.

*Note.* The metal hose (1 of step A, fig. 210.2) is designed to be installed in the compressed condition. For ease of maintenance, an adjustable wrench, (step A) should be used to assist installation.

- (1.3) Compress the metal hose (1 of step A, fig. 210.2) far enough to expose the rubber hose assembly (2 of step A).
- (1.4) Adjust the wrench (step A) to the outside diameter of the rubber hose assembly.
- (1.5) Insert the wrench over the rubber hose assembly and release the compression of the metal hose.
- (1.6) Disconnect the hose assembly (3 of step B) and remove the nipple (4 of step B).
- (1.7) Install the tube elbow (1, fig. 210.3) on the bracket (2) and connect the rubber hose assembly (5).
- (1.8) Torque the connection to 500 pound-inches and remove the adjustable wrench (7).
- (1.9) Install each of the three remaining hose assemblies (3 of step A, fig. 210.1) as described in (1) through (1.8) above.
- (1.10) Install the hose assembly bracket group (9, fig. 209) and secure with the U-bolts (3), lockwashers (2), and hexagon nuts (1).
- (2) *(Deleted)*